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ABSTRACT

The document comprises two issues of a journal devoted to learning and adolescence. Each issue contains articles which were contributed by participants in a conference on learning and adolescence held at Phillips Academy, Andover, Massachusetts, in 1977. Articles in the Spring issue deal with formation of adolescents' values, observations of adolescent thought patterns by a junior high school English teacher, child and adolescent development, biological and emotional maturation, and teaching for cognitive development. The Fall issue presents articles on reasoning modes and processes, teaching adolescents to review literature, paying attention to adolescents, educational research, adolescent needs, career choices, and the anatomy of learning. Graphics and poetry selections are included in each journal issue. (DB)

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The Andover Review

JOURNAL FOR SECONDARY EDUCATION

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Spring 1978

Learning in Adolescence

Special Issue supported by the Ford Foundation

THIS IS THE FIRST of two issues devoted to Learning and Adolescence, the subject of a symposium held at Phillips Academy as part of the academy's observation of its bi-centennial. The purpose of the symposium was to bring together teachers and scientists — psychologists, psychiatrists, behavioral scientists — in an attempt to combine theory, clinical investigation and practice to find what we could in three days about how adolescents learn. We made a brave beginning, although this participant learned as much about how adults, teachers and scientists viewed adolescents as he learned about adolescents themselves. I refer the reader to Peter Farrow's questions and drawing (p. 14).

Before the conference, participants submitted papers illustrating their current work and concerns. These papers were collected in a huge notebook which served as the working base of the conference. The articles in this issue are a selection of the papers submitted. It should be pointed out that with the exception of Farrow and Brown, the articles were written neither for the symposium nor for *The Review*. They will serve, however, to give the reader an idea of where we started. The fall issue will reveal not where we ended but at least the sparks struck by some able and concerned minds and perhaps some conflagration.

Dr. Eisenberg's article, which bears the subtitle "A Crisis of Adolescence," proved to be a keen insight into what came to be one of the principal concerns of the conference. Adolescents are in crisis; however, they are not alone. We can see the tensions under which they operate and learn because, for right or wrong, they are an identifiable culture. Not as clearly identifiable is the crisis under which society as a whole lives. One group at the conference concentrated on tensions in the classroom which come about through the interactions between teachers and students. This and other studies will be represented in the next issue.

The Editor

THE REVIEW invites articles, poetry and graphics from all quarters and will select material with concern for secondary education. If mailed, graphic work should be insured by the sender. It will be returned in due course in the same manner.

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A JOURNAL FOR SECONDARY EDUCATION

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Questions of Value

A Crisis of Adolescence

LEON EISENBERG, M.D.

For almost all of some 50,000 years of *Homo sapiens*, save the last few hundred years, the family served as the principal conservator as well as transmitter of culture.¹ In traditional societies, the young had only to be prepared to emulate their parents' behavior in order to function successfully as adults. Occupational skills were passed on vertically, largely by apprenticeship. Social skills were acquired by imitating the varieties of adult behavior visible to the child and by attending to social sanctions. The family was most often the work unit; parents and children labored as well as lived side by side. Parental norms represented the folk wisdom accumulated over millennia of experience; respect for age was functional as well as demanded; those who had lived longer knew more because they had encountered and overcome more of the expectable vicissitudes of the environment. Note well, however, that this celebration of the virtues of the traditional family refers only to its adaptive function in a static world; in that world, life for the vast majority was marginal and tenuous. Catastrophe, starvation,

This article originally appeared under the title "Youth in a Changing Society" as a chapter in *The Family - Can it be Saved?*, Victor C. Vaughan, III and T. Berry Brazelton, Editors; Copyright, 1976 by Year Book Medical Publishers, Inc., Reprinted by permission.

¹ Eisenberg, L.: The challenge of change, *Child Welfare* 39:11, 1960.

illness and death were man's constant companions for the greatest part of history.

With the transition from agrarian to an industrial civilization, the family's role as the economic unit was gradually eroded. Work roles of men and women became more sharply differentiated. The demand for specialized skills led to the introduction of universal schooling as the institutional invention to prepare the young for adult roles, with an inexorable and progressive diminution in the centrality of the family. At the same time, the industrial world required a mobile labor force; in the process of multiple moves, the extended family was lost as a buttress against misfortune and a resource in a time of troubles. Traditional solutions became less effective for the challenges provided by social change; adaptability, the hallmark of youth, had greater immediate salience than the overlearned and more rigid responses of the old. Again, if the price of change was the gradual erosion of traditional values, it also brought with it such benefits as better health, longevity, opportunity and a standard of living that few have hesitated to pay the price. Indeed, the developing nations today, rather than drawing back in dismay at the contradictions glaringly visible in the midst of Western "success," seem hell-bent on following our example.

The concepts of ecology have become even more widely employed in contemporary political debate as we become aware of the ways in which we have upset the delicate balance of things on this planet.² We consume irreplaceable resources; we create more waste than we can dispose of; we multiply without thought of consequence. We have developed technologies of convenience only to discover that we have transmuted gold into dross. We have become a species endangered by the psychosocial fallout from chain reactions within our modes of living that occur at an unprecedented rate.

What we have failed to recognize is that the rate of change is accelerating; the conventional indices of "progress" are insufficient

² Eisenberg, L.: Poverty, professionalism and politics, *Am. J. Orthopsychiatry* 42:748, 1972.

to measure full costs; unevenness in the distribution of benefits belies the appearance of average gains; doubling and redoubling of quantity threatens qualitative deterioration. Changes in our daily lives occur at such a pace that discontinuities rather than mere differences appear between the life experiences of the old and the young. Social pollution undermines the role and function of the family.

The nuclear family has become almost the sole source of affective sustenance. Mobility has attenuated ties to the extended family and to friends. More and more of us live in large metropolitan aggregations, work for ever larger and therefore more bureaucratic organizations and are more remote from and less able to influence governmental agencies. Interpersonal transactions are dominated by ritual and rule that leave little room for affective interchange. With all our emotional eggs in the nuclear family basket, breakage is both more inevitable and more devastating when it does occur. Economic stringency requires both parents to work (when work is available) and thus to be less available to each other and to their children; society has not yet provided social supports in the form of family extenders that could mitigate the impact of work demands.³ That the family is ill-equipped to withstand these strains is documented by the divorce rate and the growing number of single-parent families, a disproportionate number of which are found below the poverty line, doubly disabled.

That our young are in serious trouble is evident from the merest scanning of such crude social indicators as soaring rates of juvenile delinquency (including a disproportionate increase in crimes against persons), the large numbers who fail to learn to read with proficiency by the time they leave secondary school, and even the decline in Scholastic Achievement Test scores among college applicants, the most privileged of our youth. The over-all figures, appalling as they are, convey only part of the wastage. The situation among minority groups is severalfold worse; it is they who bear the brunt of the social breakdown.

³ Eisenberg, L.: Caring for children and working: Dilemmas of contemporary womanhood, *Pediatrics* 56:24, 1975.

How have we come to be where we are?

As with the family, the circumstances of the young have undergone radical change. To begin with, there has been a cumulative trend toward lowering of the age of puberty such that over the past century in industrial nations the age at onset of menarche has declined by four months in each decade because of better nutrition and health. This secular trend has finally reached an asymptote among middle class populations. The lasting result, however, is a significantly younger age of entry into the physiologic state of adolescence.⁴ Simultaneously with this biologic transformation, the duration of adolescence as a social stage has been sharply increased at the upper end by the prolongation of the time of schooling as preparation for adult work roles. Whereas at the turn of the century less than 15% of young Americans between 14 and 17 were enrolled in secondary schools, the ratio now stands on its head with well over 90% in school. Colleges and universities, enlisting an elite 4% of the 18-21-year-olds 75 years ago, now incorporate ten times that percentage. There have been comparable gains in the proportion attending graduate schools for four more years; they comprise about half of those who complete college (that is, 30% of those who enter it). Conversely, there has been a progressive decline, even during the past decade, of adolescents and youth participating in the labor force, even part time.⁵

It is difficult for those of us who grew up considering schooling a privilege (and still regarding it as such) to recognize that schools control a vast legion of draftees, not volunteers. The growth in the population, the lengthening of the school term, the reduction in the frequency of absences and the increasing rates of retention in higher grades combine to produce an aggregate of youth-years in full-time school such as to make schooling a huge growth industry, only now showing the first signs of recession because of a declining birth rate. Emphasis on economies of scale rather than on the quality of the learning environment led to consolidation of

⁴ Eisenberg, L.: A developmental approach to adolescence, *Children* 12:131, 1965.

⁵ Coleman, J. S.: *Youth: Transition to Adulthood* (Chicago: The University of Chicago Press, 1974).

schools and school districts. In the 1960s alone, college enrollments doubled; the unprecedented increase in the student population was accommodated by growth rather than multiplication of universities, such that 50 now enroll in excess of 20,000 students (some as many as 50,000!) and 60 enroll more than 10,000. Sheer numbers ineluctably dictate organizational complexity, proliferation of administrative bureaucracy and assignment of priority to managerial goals. However unreal President Eliot's image of the student at one end of a log facing Professor Hopkins at the other, the late twentieth-century counterpart is that of a lecture hall full of students relating to the Professor's image by remote telecast. The potential for diminishing segregation by race and class, which might have offset these diseconomies of size, has notably failed to occur because of housing patterns, the gerrymandering of school districts and selective admission policies.

The environment of the school contrasts sharply with that of the work place. It focuses on learning rather than doing; it provides opportunities for self-development at the expense of contributing to others. Its thrust is competitive rather than cooperative; its graduates filter through an ever-narrowing sieve, safe passage through which is correlated with test and grade performance. Nowhere is the devastating impact of this desperate scramble more evident than in its destructive effect on the college experience of premedical students, only one in three of whom will gain the coveted laurel of admission. For all of these years, the student remains financially a dependent. In contrast, the young worker is a producer, who not only supports himself or herself but society as well. The nature of the industrial enterprise demands collaborative effort on the production line. Moreover, the worker's limited ability to increase wages can be enhanced only by joining with others in a trade union. The work may be — all too often is — intrinsically unsatisfying, but the only avenue for modifying it lies in common undertakings with fellow workers, both older and younger.

One major effect of the progressive substitution of schooling for working and the gradual constriction of family size and time to-

gether has been the age-segregation of youth from adults and children. Commercial enterprises have long since targeted a significant fraction of their promotional efforts on this huge market. In the decade of the 1960s, the population aged 14-24 years increased in absolute count by more than it had in all of the 60 preceding years of this century; its ratio to the adult cohort (25-64 years of age) grew from 0.32 to 0.45, a 40% change! Coleman⁵ has stressed the features that characterize "the youth culture." It looks inward toward its peers who become models for attire, entertainment, politics and "life style." It substitutes age-mates for family members as sources of approval and affection; the isolation and alienation it feels as a group feed its press for autonomy, which often is defined more in the negative than in the positive mode; and its self-perception as underdog generates a receptivity to change, with insufficient attention to social costs. The exuberant and unrealistic slogans of the French "youth revolt" in May of 1968 so threatened the concern for social stability in the rest of the population that the conservative Gaullists received a substantial mandate in the subsequent election.

You will have noticed in this a shift toward a delineation of youth almost as though it were a social class, without differentiation into worker or student, poor or rich, black or white, female or male. Yet, for each of these subcategories, lifetime expectations differ sharply, particularly when disadvantage by income, race and sex is summed. The young in each of these categories share more fully the attributes of their own elders than they do those of youth as a group. We are in danger of perpetuating the very error embodied in the youth slogan popular just a few years ago: "Never trust anyone over 30."

The problems of youth do indeed have special poignancies, but they are the problems of society in general and cannot be solved except in that context. When the PSAC Panel on Youth⁶ calls, and rightly so, for job opportunities for the young and interleaved work-study programs, with a lower minimum wage to facilitate youth employment, its recommendations are hollow while there are 9,000,000 Americans out of work, with an official over-

all unemployment rate of 8.7% but a rate for black teen-agers of 41.6% (*New York Times* 4/6/75). The gradual extension of the school-leaving age and the laws against child labor may have had humanitarian aims; they have also served to restrict the potential labor pool when it threatened to expand beyond national capacity to absorb it. The bitter antagonism among white blue collar workers against affirmative action in behalf of excluded minorities assuredly reflects racism and sexism, but it is markedly intensified by the shrinking labor market. We observe precisely the same phenomenon in academe, where the resistance to equity for women and minorities has taken on a new urgency (and more elaborate rationalizations) now that fewer faculty positions are to be had. Unless youth, women and minorities make common cause with white male workers in fighting for full employment, all must suffer.³

To state it flatly, the problems of youth in a changing society are the problems of a society in the midst of a crisis of nerve. For the better part of this century, the power of the United States was so awesome that it was — or appeared to be — decisive in events the world over. The fall of the Kuomintang on mainland China was the first major evidence of the era we were entering. It was so out of keeping with America's self-perception that the prevailing theory was that of conspiracy; it wasn't that the outcome was beyond our control; we were betrayed by cryptocommunists in high government positions. The collapse of the regimes in Cambodia and Vietnam is a further blow to belief in American hegemony; it remains to be seen whether this, too, will be explained away or recognized as hard data that must be accommodated within a realistic world view. In the same span of time, the malign neglect of civil rights and the gradual abandonment of even the slogan of a war against poverty force acknowledgment of the necessity for structural change in the distribution of benefits; overflow bounty from an expanding gross national product simply doesn't trickle down equitably.² The code word "Watergate" stands for an unwanted view of the extent to which cherished democratic rights have been violated behind a façade of legal government. Inflation

and recession bring the mess into every home. We adults have responded by doubting our nation instead of its leaders, by doubting ourselves instead of our misconceptions, by turning against our young because they have insisted on confronting us with our contradictions.⁶ Despair substitutes for thought and paralyzes action. The sophisticated professorial stance, 1975 model, is to decry the soft-minded "knee-jerk liberalism" of the preceding decade, to refer learnedly to theologic doctrines of the imperfectibility of man and to settle down to an observer's role — on a tenured salary.

Cynicism and pessimism guarantee perpetuation of the status quo. The failure lies not in the grandness of our dream but in our lack of commitment to it. The shattering of illusions opens the way to coping with reality. Let me set forth some of the elements of a social program that can begin to restore ecological balance in the quality of life.

The essential role of the family and the satisfactions it provides to its members need buttressing. This should include income maintenance, universal health care and a network of child care centers to ensure the healthy development of children. If move we must, we can reinvent the extended family by including friends as kith and kin. Foster grandparents provide gratification for themselves as well as the youngsters they relate to. Our goal must be a culture in which the welfare of children is the concern of every citizen.³

A second set of measures would focus on facilitating intergenerational sharing. Day care centers and nurseries can be located adjacent to intermediate and secondary schools. Adolescents not only will provide a source of person power but will learn how to be better parents in the process of contributing to the development of the young. Adolescents can learn to teach as well as be taught by serving as tutors for younger children. In setting classroom goals, emphasis should be placed on group achievement in addition to individual accomplishment; each should feel some responsibility for the success of the other. Work experiences for high school and college students should be facilitated by making time available

⁶ Eisenberg, L.: Student unrest: Sources and consequences, *Science* 167: 1688, 1970.

within the regular program and encouraging experimentation with time out at no cost to subsequent re-enrollment. Social subsidy of both early work and later education should be universal in order that opportunity not be limited by income.

At their best, the adolescent years are characterized by the development of idealism and concern for the general welfare. No educational task is more critical than the cultivation of these most human of all qualities by providing experiences to permit their fullest flowering. However short such programs as the Peace Corps and Vista have fallen from their announced goals, they can serve as prototypes of opportunities for the young to attain full humanity by contributing to others. This is but a special instance of a more general proposition: the need for meaningful work roles throughout the life span. It is obscene that we tolerate unemployment (as a means of slowing inflation by shifting its burden to an underclass) in the midst of work that needs doing for social benefit (housing, urban redesign, recreational facilities, human services). It will be a major challenge to re-examine the nature of work, the ways in which its organization can be modified to enhance the satisfactions it brings and in which a broader range of personal choices can be ensured. Work will remain work, but its significance will differ if it is seen to be contributory, if it is socially valued and if each of us has a felt need to participate in the social enterprise.

In each area, we confront similarities between the problems be-
deviling the young and the old and the impossibility of resolving
the one without simultaneously attending to the other. The flam-
boyance of youth enables it to articulate, sometimes in caricature,
values implicit in a culture that is excessively individualistic in its
orientation. "Doing your own thing," even with the proviso that
your own thing not injure others, is grossly insufficient as a pre-
cept for the social contract. It gained currency in an era of mani-
fest affluence in which a few could enjoy the luxury of personal
indulgence so long as the majority, whether by necessity or by
choice, continued to provide essential goods and services. It be-
tokens a serious failure in the process of socialization if our citi-

zens come to maturity without a sense of obligation to others. The lack of a shared moral commitment underlies intergenerational alienation.

Social groups as different in their political structure as the Israeli kibbutz movement⁷ and the collectives in the People's Republic of China⁸ have succeeded in evoking responsible performance in their youth and, at least to some extent, in internalizing a sense both of social obligation and of personal worth as a consequence of that performance. From our perspective, that spirit of collectivity appears to be exacted at too heavy a price in its loss of individual choice. Let us acknowledge that we have overstressed individuality at a considerable cost to social connectedness. These values should not be antinomies. The social contract exists to foster personal freedom; self-fulfillment enables the individual to contribute most effectively to society. When personal choice is enjoyed by some only at the cost of intolerable restriction to the freedom of others, there will be a day of reckoning and an inescapable press for change.

I have written as a moral philosopher. I hope I have persuaded you that questions of value permeate the issues we are addressing. I have set forth my belief that concern for social justice and equity is the organizing theme for fostering adolescent and young adult development. From that central concept flow parallel proposals for political and educational reform. What youngsters are taught in school and in the home as the good life must bear a recognizable relationship to the world in which they live, as the goal toward which it is striving.⁹ The teacher must be a doer as well as a learner. The young question what we have come to accept; if we hear their questions and join them in the search for answers, both will become the wiser.

⁷ Eisenberg, L., and Neubauer, P.: Mental health issues in Israeli collectives, *J. Am. Acad. Child Psychiatry* 4:426, 1965.

⁸ Chan, L.: New people in new China: As reflected through education and child rearing. Presented at the Biennial Meeting of the Society for Research in Child Development, Denver, April 11, 1975.

⁹ Eisenberg L.: Racism, family and society: A crisis in values, *Ment. Hyg.* 52:512, 1968.

Let me conclude with words I used in another context:¹⁰ "Our most central task is encouraging the development of humane values based on the recognition that we are a single species. . . . Learning must become a social enterprise informed by concern for others. . . . By acting on behalf of our species we become men and women. . . . The study of man takes its meaning from involvement in the struggle for human betterment. Struggle it is and will be; privilege does not surrender easily; false belief is not readily dispelled. The optimism about man's potential I urge upon you is not the comfort of reading history as a saga of human betterment which will one day be complete. It matters, and matters dearly . . . whether that day comes sooner or later; whether it comes at all is not determined by history but by the men and women who make history. . . ."

¹⁰ Eisenberg, L.: The *human* nature of human nature, Science 176: 123, 1972.



KRISTEN TIMKEN

SHARKS

Sharks in these waters! the trim white
Coast Guard cutter repeats and repeats

Its friendly persuasive warning
To each beach, and the swimmers come

Hurriedly to shore, to lie hot and lazy
On the sharp sand, looking

All afternoon seaward for the steep
Dark dorsal fin

That might or might not come pricking
Like a needle through the small wind-waves.

If it does
They will rise and point excitedly and rush

To the water's edge, and then back.
And if it does not, still they will dream

Of the sinuous explorers of the blue chambers
Of coastal waters moving

Easy as oil, without a wasted stroke,
In and out the warm coves. But slowly

The heat eases, and the wind picks up,
And since nothing has happened

A few figures dare the water to their waists,
Forgetting, as men have always forgotten,

That life's winners are not the rapacious but the patient;
What triumphs and takes new territory

Has learned to lie for centuries in the shadows
Like the shadows of the rocks.

MARY OLIVER



the Presymposial state

PETER FARROW



*While I don't know what will happen at Andover
if I do submit this paper....*



*... I do know what will happen at Country Mile
If I don't. . . .*

Therefore:



*How many of the problems (and phenomena)
of 14-18 are generated by ourselves?
Are our own chickens coming home to roost?*



Since all education involves some vision of the future, how much of that vision is self-projection?



How clearly do we accept that our models may not be best — even for ourselves?

We are surely aware of the “generation gap.” Are we equally aware of its absolute necessity — that, in the long run, it is neither a social nor psychological phenomenon, but a phylogenetic one? (We meet as a symposium of human beings rather than as a clotting of protozoa only by virtue of endless generation gaps, after all.)



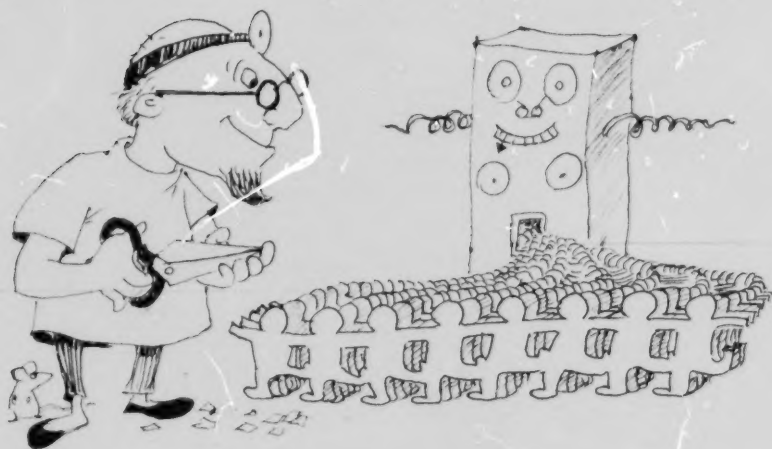
How clearly do we separate teaching from learning? Do we accept that they are essentially two entirely separate processes which may, on occasion, happily coincide?



... And how clearly do we separate education from training?

Do we accept that education is a subjective, non-reproducible and ultimately non-measurable affair? That it is inherently not adaptable to mass schooling — at least under present conditions?

Do we accept (and thus begin to fight) the fact that most of today's education is essentially social and economic conditioning, properly belonging in the field of training and not education at all?



... Are we seeking to utilize science — or hoping to scientize education as a whole? Is our increasing dependence on objective (and largely quantitative) method contributive to learning per se?

Are we dealing with something which is, at heart, not a science at all, but an art?

If an art, reproducible result is anathema; if a science, reproducibility is essential. Is current "scientization" a search for a reproducible result — or mass-producible method?





If we are to be scientific, then how well can we accept the fact that education is essentially an information distribution system, scientifically inseparable from cybernetics, subject to physical law, and exhibiting many of the principles of both classical and modern economics?

How well have we assayed our role in such a concept?

... And what have the results been?

What criteria do we employ to determine who gets
what?

And what criteria do we apply to those criteria?





*... And to what extent are those same
criteria modified by our tacit expectations?*



*At what point are we prepared to say "No" to
science's influence in education?*



Is education relying too much on mere professionalism?

Exploiting the "professional mystique?"



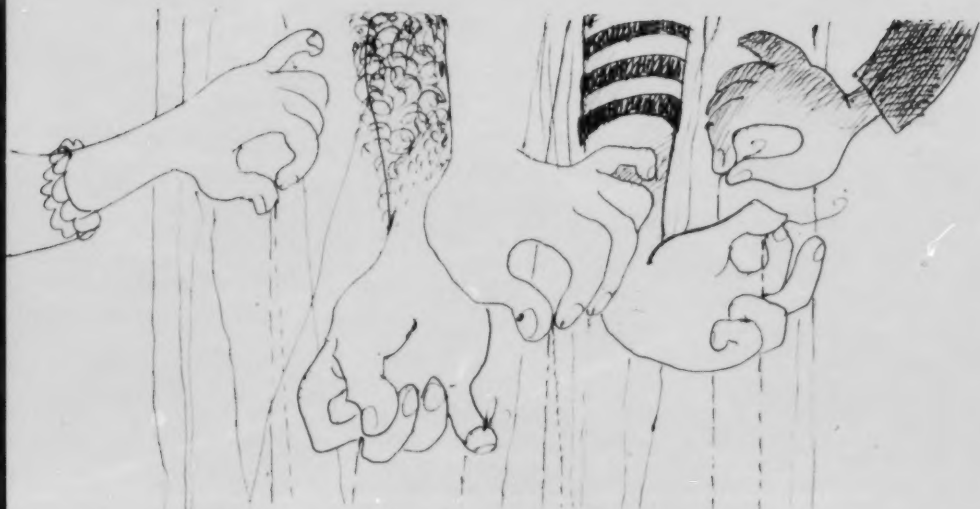
... Or, if not the "professional mystique,"
how about the "Mendicant Myth"?

*Have we at last admitted, to ourselves at least, that
today education is ...*



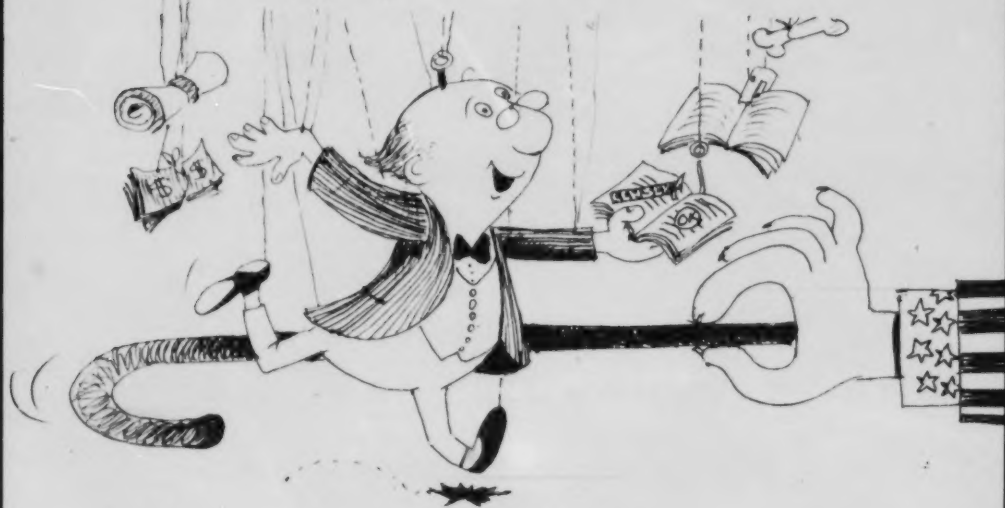
... one helluva big business—second only to national “defense” in its dollarhood and, like any other business, incorporating such factors as planned obsolescence, consumerism, unitization, deferral, consent engineering, premanaged production, trade unionism, economic life and organized waste?

... And, of course, profit.



And through all this, have we asked, really, what — and who — pulls our strings? What are the origins of our criteria? How effectively do we balance (or defy) external demand?

Doubtless, we have the freedom to inquire, the freedom to discover. Do we have, however, the freedom to apply? Has academic freedom been compromised not by tyranny, but by the orchestration of reward and by benign neglect?





*As for our own innermost thoughts —
as people c. 35-65 undertaking a study of
other persons 14-18:*

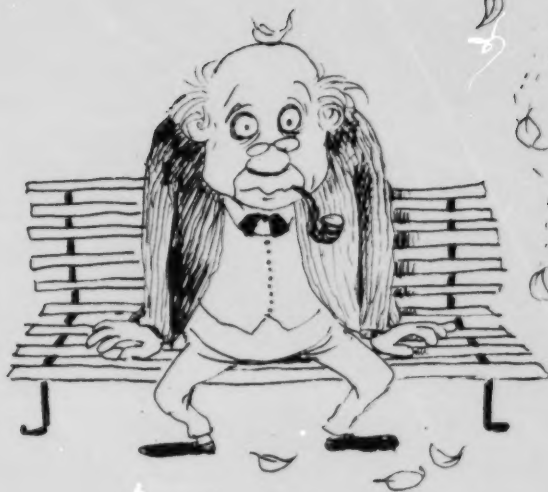


*We can probably agree that 14-18 isn't quite what it
used to be. . . .*



... We may even admit to having been 14-18 ourselves.

... But how willingly do we accept
that we will
never
never
never
be 14-18 again?





In all, are we running a little scared?



... Perhaps so.

But the chances are still pretty good that the kids
will forgive us.

COCK ROBIN

Who made the poem?
Father claimed "I
with my will
I cast the die."
"Me" sang Mother
"with my mothering song."
"Wrong," piped teacher.
"I worked long
sifting right and sorting wrong."
"We" said the friends
"did the chorus part."
"No," said the stoneman
"It was I, bruised the heart
and cleared the eye."

DIANA DER HOVANESSIAN

FALLING INTO THE MOMENT

Everyone is disappearing,
you must be getting older, you are
stripping, one by one, your leaves.
You begin to give away books,
bracelets, your comb collects hair,
freckles pepper your hands.

Your body repels you, the mirror
no longer casting a spell.

Yet, even now, when you let yourself
fall into one of the moments

you are trying to rush through,
you find yourself in a small boat
paddling channels, gathering lilies,
the sun settling on the water.

An experiment in light, a kind
of chemistry, a simple radiant equation.

PHYLLIS JANOWITZ

Before and After

Two Ruminations of a Teacher of Adolescents

WILLIAM H. BROWN

Diversity is the one constant. As one meets a class of fourteen-year-old students, he is struck by differences in height, weight, timbre of voices, experience reflected in discussion, in a word in maturity. If one conceives of this class as on the starting blocks in the race to graduation at eighteen, he cannot avoid the impression that it is a very uneven, indeed unfair start. It cannot be doubted that these differences in physical and social maturity are reflected in differences in the development of skills and capacities of the mind. And yet, when one meets these same students two or three years later, these differences seem to have largely disappeared. The closer students come to graduation the closer they come to a common denominator. What have we done to bring this about? Have we destroyed individuality, and the initiative and the verve that goes with it? Or is there some biological and psychological leveling process which is for the most part independent of the educational process? What seems to be true is that it is exciting to teach this fourteen-year-old class for the very reason of its diversity, and often disheartening to teach the older classes in which the responses are predictable and stereotyped.

In an English 10 class, I taught the *Odyssey* in the Fitzgerald translation, subtle and beautiful poetry. I let the poem teach itself. Nothing was said of the technique of the poetry, of its structure, of its historical significance. There was great excitement, animation in the discussion of father, mother, son, home as well as of adventure, courtesy, customs of hospitality, fidelity, greed and treachery. The following term, we read Twain's *Life on the Mis-*

issippi. I fell into the trap common to the teacher of English: I found myself talking about technique. Although I avoided set terms of irony, point of view, I emphasized the point that Twain was talking about himself as a young and foolish person in a young and foolish society from the vantage point of an older man. We looked at the tone of sentences and the structure of the paragraphs. There were members of the class who had reached a point in their development in which they could meaningfully talk about irony, tone and structure. There were others who could not but were willing to play the game. And there were still others who were lost and fell silent. The discussion lost its verve; it was dead.

Other differences in the fourteen-year-old class: there were males and females in equal numbers. The most interesting difference that I noted was that the males were far more mechanistic in their approach. They were concerned to make sentences parse; they were amenable to punctuation; they were interested in structure: how a story was put together — how a paragraph was organized. Females were more intuitive: they tended to be attracted to the sound and rhythm of a sentence, rather than its grammatical correctness, to the emotional content of a story, rather than its structure. If these differences are allowed to remain, the net effect is one of mutual stimulation. If I made an attempt to bring them together, to arrive at a common ground, deadness crept in. Diversity is stimulation.

There were blacks, caucasians, orientals, those from well endowed schools and from deprived and depressed schools. These differences too can bring life to the class if allowed to work, and a deadness if suppressed or homogenized. But homogenized they seem to be as the students grow and move to higher classes.

There is, however, a point at which this diversity does not operate in the productive manner which I have indicated. Several years ago we began a concerted effort to admit disadvantaged students, disadvantaged in every sense: ethnic, socio-economic. I taught a segregated class of such students, all but one of whom were black, all of whom came from distinctly deprived

homes, communities and schools: ghetto, country, north and south. If these students had been thrown into the general mix, we feared that they would have been unable to relate to their varied classmates, they would have been unable to contribute, even to communicate. The course was called Language. We studied Swahili, Tagalog. We worked on a generative grammar in these languages and in English. We read and we wrote, and we developed an esprit such as I have seen in few classes. Curiously, as the year wore on, the class developed a healthy diversity of its own, a recognition that the students despite their ethnic and socio-economic similarity had widely different capacities and were at different stages of development. At the end of the year, they went their individual ways and were remarkably successful in their secondary education.

A TEACHER'S INTRODUCTION TO PIAGET

The figure of Jean Piaget hovers over the symposium which serves as the base for this issue of the *Review*. His writings over the past fifty years have brought about a quiet revolution, the results of which in psychology and education are becoming increasingly apparent. It is impossible to summarize the extent of his findings within the compass of a short article. I have, therefore, turned to his *Six Psychological Studies* (Random House, New York, 1967), edited by David Elkind and translated by Anita Tenzer, herself a practising psychologist. These studies, consisting of articles and lectures, cover a period of twenty-five years from 1940 to 1965 and thus give a sense of the range, complexity and development of Piaget's theory. Elkind's introduction is of invaluable aid to both the layman and the specialist. He gives clearly the bases of Piaget's theses, previously available only to the psychologist.

The first point that Elkind makes is that Piaget is a genetic epistemologist, not a psychologist. In other words, he is concerned with the theory or science of the method and grounds of knowledge as the basis of tacit knowledge evolving from birth through early childhood to adolescence and adulthood. The three themes which persist in Piaget's evolving work are logic, relativity and dialectics. Elkind makes the sobering observation that genetic epistemology is a multi-disciplinary system demanding as a minimum an acquaintance with biology, physics, logic and philosophy. Whatever use the psychologist or the educator makes of Piaget, and the possibilities are virtually unlimited, it should be clear that the result is just that — the psychologist's or the educator's use, not Piaget himself. I am certainly not a psychologist and resent the term educator. I am, however, a teacher and as such, despite the great demands Piaget makes, find his writing exciting and provocative.

The demands are great indeed and not lessened by the necessity of reading in translation. Piaget's French is difficult as French; therefore, Tenzer's translation is all the more vital. For instance, the term *egocentricity* has for the speaker of English an unavoidable pejorative implication. As used by Piaget it is a statement of fact as to the way the child up to the age two perceives the world around him. *Equilibrium*, the key to Piaget's dialectics, does not imply stasis but is something which is active and ongoing, the basis of the genesis of genetic epistemology. *Structure*, another key word, is "a mental system whose principles of activity are different from those of the parts which make it up."

The stages which Piaget indicates in the development of cognition of the child are the best known and most often referred to. They are birth to the age of two, from two to seven, from seven to twelve and adolescence. Piaget recognizes that there are individual variations within these groupings caused by the differences in heredity and environment, but at the center of his findings are the stages of cognition themselves.

Birth to age two is characterized as a Copernican revolution. At

the beginning the child grasps everything to his own body; at the end, when language and thought begin, the child is but one entity in a universe that he has constructed himself. The child starts with only one system of knowing labeled sensorimotor. This system is differentiated into new systems which together with the old constitute a broader organized totality. (I am here incorporating the diction of Piaget as translated by Tenzer.) The infant by the age of two has constructed categories of object, of space, of causality and of time — all these in terms of practice and action, not in terms of ideas or thinking.

Ideas and thinking are made possible by the acquisition of language, which characterizes the second stage, two to seven. Language allows the child to reconstitute the past and anticipate the future. It also begins the socialization of the child, drawing him from his initial egocentric state. This age is characterized by practical intelligence; action far outweighs thought. The child does things indicating intelligence but often can not explain why. At this stage reality is constructed with the self as model. Moral thinking is in terms of obedience to the adult.

Stage three, from seven to twelve, is marked by the beginning of logic in concrete terms. The child at this stage will accept rules of a game such as marbles as handed down to him rather than play egocentrically as he does in the previous stage. The morality of unilateral obedience changes to one based on mutual respect. The child becomes capable of cooperating. Intuitions become operations when they are systematized through action and become part of a larger whole. Father, son, uncle, aunt become part of the concept of relationship. Numbers are not random — 3, 25, 10, 6 — but part of a system — 1, 2, 3 or 2, 4, 6, 8 or 3, 2, 1, or 8, 6, 4, 2 — in other words reversible, a necessary quality to the nascent logic characteristic of this stage. Addition is reversible to subtraction; multiplication, to division. Time, rate and space are concepts in that they are what Piaget calls *schemata*, within which thought becomes possible. It would seem, then, that the logical process is complete at approximately age twelve and that adoles-

cence is merely an awkward physical passage to adulthood.

However, there is a fourth and for the purposes of secondary education a vital stage, that of age twelve to an undetermined adulthood. What distinguishes stage three from stage four is movement from concrete logical processes to formal or abstract logical processes, or what Piaget calls "hypothetico-deductive" thinking. Piaget recognizes in passing the phenomenon of puberty and the disequilibrium it brings but does not put it in a central position. Rather he sees hypothetico-deductive thinking as the end of a continuing process which begins in early childhood, something that coincides with puberty but is otherwise unrelated. What is more, the concrete operations of stage three must be complete before the formal operations of stage four are possible regardless of age or physical state. There are indeed adults of any age still operating concretely, incapable of formal operations.

At stage four the power to think in terms of concepts freed from concrete manipulations leads the person to impose on the world and the self theoretical possibilities. This theoretical self and world are out of equilibrium with the actual world, the world outside of adolescent thought. A compensating accommodation with reality brings about a new and advanced equilibrium, which presumably leads to adulthood. This same hypothetico-deductive thinking produces a *lebensplan* (life plan), which in turn creates a personality distinct from the egocentric self of the early stages.

All the foregoing comes from the first and the longest of the six studies, which Piaget summarizes as follows:

This then is mental development. In conclusion, let me point out the basic unity of the process which, from the construction of the practical universe by the infantile sensorimotor intelligence, leads to the reconstruction of the world by the hypothetico-deductive thinking of the adolescent, via the knowledge of the concrete world derived from the system of operations of middle childhood. We have seen how these successive constructions always involve a decentering of the initial egocentric point of view in order to place it in an ever-broader coordination

of relations and concepts, so that each new terminal grouping further integrates the subject's activity by adapting it to an ever-widening reality. Parallel to this intellectual elaboration, we have seen affectivity gradually disengaging itself from the self in order to submit, thanks to the reciprocity and coordination of values, to the laws of cooperation. Of course, affectivity is always the incentive for the actions that ensue at each new stage of this progressive ascent, since affectivity assigns value to activities and distributes energy to them. But affectivity is nothing without intelligence. Intelligence furnishes affectivity with its means and clarifies its ends. It is erroneous and mythical to attribute the causes of development to great ancestral tendencies as though activities and biological growth were by nature foreign to reason. In reality, the most profound tendency of all human activity is progression toward equilibrium. Reason, which expresses the highest forms of equilibrium, reunites intelligence and affectivity.

As mentioned earlier, the three basic Piaget themes are logic, relativity and dialectics (equilibrium). Piaget makes the point that logic is not innate; it is acquired by the developing systems outlined above. Logical rules are not imposed as are some rules of say grammar but are derived by collective interaction through common work and verbal exchange. Relativity is key in that it establishes the relationship between the self and the world of reality outside the self. The growing child perceives more and more of the outside world, relates, combines these perceptions in successive, interdependent, evolving operations, reaching a series of compensations with the former state. Piaget's use of dialectics is what he calls equilibrium. Equilibrium is the dynamic of the progression which Piaget outlines in the quoted passage.

He defines genesis as "a certain kind of transformation which stems from State A and results in State B, where State B is more stable than State A." The first characteristic of equilibrium, then, is that it is stable; it is, however, mobile, a series of actions. It is also subject to external intrusion. There is equilibrium when the intrusion is compensated by the actions of the subject. Finally, it

is active; the greater the equilibrium, the more the action. Thus the various stages through which the child passes from birth to maturity are major states of equilibrium; within these stages are what might be called secondary states of equilibrium, each state more stable and more active than the one preceding and having its genesis in it. What causes the transformation is the need of the subject which comes about by a widening perception of reality, the general world, the world outside the self, the inevitable though variable socialization of the individual.

It should be clear to those who have struggled through to this point that I am no psychologist, let alone epistemologist. Any attempt to reduce Piaget's thinking to these few pages is bound to be nothing short of ludicrous. I have of necessity not touched on the fascinating practical experiments by which Piaget's thoughts are arrived at and illustrated. What I have tried to do is to concentrate on those elements which should be of interest to the secondary teacher. There has long been a conflict of views between affective and cognitive education, roughly between what a person takes in through the pores, through emotion, through intuition and what a person is taught through the intellect. Piaget dispels this dichotomy. He says that a person feels a need stimulated by the world around him and instinctively reaches out but that the intellect forms the systems, structures, on which the various stages of equilibrium depend; in other words, affectivity and cognition are integral parts of the same process. However, the activity which determines the mental growth of the infant to childhood to adolescence to adulthood begins and ends within the individual. Teaching the results, he says, will speed but not introduce the operations on which growth depends. The child must feel the need before there can be any activity. The need comes from the child's contact with his environment. To the extent that school or schools constitute the environment, the mission of the teacher becomes quite clear.

The ages assigned to the various stages are neither sacrosanct nor rigid. Nothing inevitably happens at two or seven or twelve.

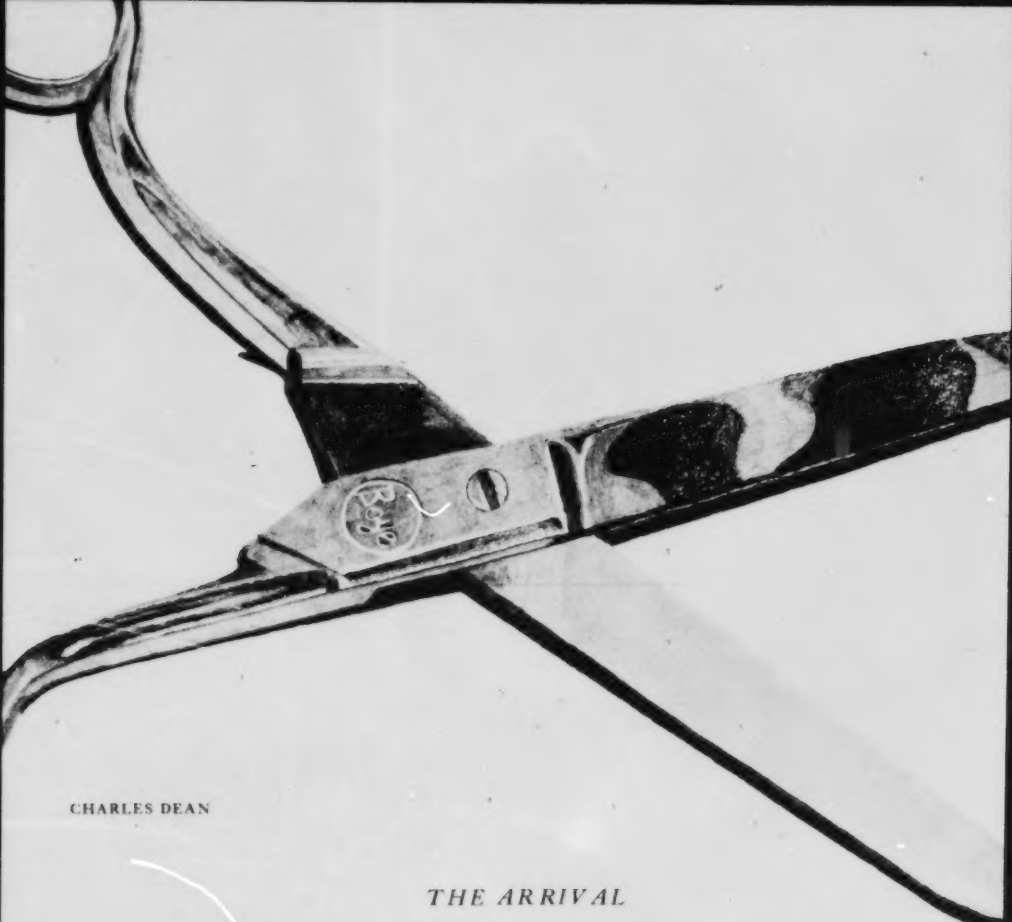
The operations characteristic of the stages and the gradual transformation from stage to stage and the equilibria within the stages are what are important, not to say vital, to the teacher and to the student. Since we are embarked on a symposium on how adolescents learn, the transformation from late childhood to adolescence, from concrete operations to formal and abstract operations, from thinking determined by the practical and the concrete to hypothetico-deductive thinking is the crux. Those who teach in secondary schools certainly can not assume that the physically adolescent students they meet in their ninth grade classes are capable of and inclined toward abstract thinking characteristic of the fourth stage of mental development. When a teacher finds a student incapable and disinclined to deal with hypotheses and to reason free of concrete controls, he must discover where the student is on the scale of concrete operations and start from there. He must devise courses and methods that will create a need for hypothesis and deduction and thus make possible the transformation from stage three to stage four. Once the student is well launched into mental adolescence, then it becomes the function of the teacher and the school to bring the world as it is (reality) to the student or to provide ways by which the student can get to reality so that the student may make the necessary compensations which lead to what may be called an adult equilibrium.

The adolescent's hypothetico-deductive activity is directed not only to the social world but to himself; he creates a life plan from which comes personality. This personality is an objectifying of the egocentric self, "a kind of decentering of the self." Since it is the result of hypothesis and deduction, the student must again make the adjustment to reality. Whatever the secondary teacher can do to help the student in making this adjustment possible he should do, always recognizing that the process is a response of the student to a need which originates within the individual and reaches an equilibrium there.

In his reference to the life plan, Piaget makes the only distinction I have been able to find between male and female: "Undoubtedly,

the life plan of young girls is more closely linked to personal relationships, and their hypothetico-deductive systems take on the form more of a hierarchy of affective values than of a theoretical system. Nevertheless, they are also concerned with a life plan that goes far beyond reality. If their life plan is more concerned with people, this is because the life for which they are preparing is more concerned with specific interpersonal feelings than with general emotions." I leave this statement to the reader to do with as she or he will.

Finally, if Piaget does not stop at age fourteen, as commonly supposed, he does not extend his stages beyond adolescence. He does, however, imply that the child is father of the man, that one can understand adult operations by understanding the evolution of the childhood operations. He also makes the point that there is no reason to suppose that there is not or can not be continuous development through adulthood. What is important for the teacher in secondary education is his feeling that the nature of adult thinking will be determined by compensations reached during adolescence.



CHARLES DEAN

THE ARRIVAL

The river has cut a new path.
I know where I'm going,
following it, though
I was here just once before
when the trees were brown.
I can also track birds
to their nests: I know the colors
they take when they think
of home, and how
their feathers lift just before
entering. Here everything
is probable. The leaves
have already turned their faces
to the sun, and this is still
the beginning.

SUSAN LUDVIGSON

THE WASTES

Life is clammy, the shepherd said,
and gives off an odor of medicine.

The closer we come to what we want,
the more ordinary it becomes. The less

desirable. Eventually it sickens,
filling our heads with grey boredom.

All excitement deadens from the inside out,
and finally leather rubs against leather:

Life risen to its own surface uglier and wiser.
Then what is the answer? the animals wondered.

Pain, labor, frustration and desire,
said the shepherd, all conspire

against the monotony of our lives.
It is this constant effort that erodes

the tedium and casts it afloat, an island
in the fresh, bedazzled and heavenly ocean.

LITERATURE

The shepherd read from the book.
The animals shook. Why can't they say

What has to be said? they said.
They gum it up with themselves.

All that style and bombast.
Meaning! We want something we can use!

Something spare, sensible and mystical.
Something absolutely intelligible.

A gem. Of value again and again.
A stone that can be worn.

RICHARD GROSSMAN

Rebalancing Balances

Piaget and Personality

ROBERT GRAHAM KEGAN

Woody Allen says he was thrown out of college for cheating: during a Metaphysics exam he looked into the soul of his neighbor. This kind of metaphysics is what I understand psychology — *psyche* and *logos*, a reckoning of the spirit — to be about. Its first aim is always to understand something *fundamental* about us. The psychologist, as I would have him or her, does not lose sight of the fact that his activity is intrinsically philosophical, the examination metaphysical; but he is wary of self-deception and so he “cheats” — he looks into the soul of his neighbor for verification.

When Freudianism proved unable to deliver empirically on its promise of explanatory power, the field of personality went into decline. What was once, under Freudian influence, a proud, theory-guided investigative discipline has now come down to something more like an atheoretical nomological entrepreneurialism. Were the work of the most recent generation of psychologists all we had to go on in seeking a meaning for the very word *personality*, we should have to call it, Jerome Kagan says, “variation among individuals in locally valued traits,” rather than make references to any whole or dynamic system or process (personal

(Abstracted from a doctoral thesis entitled “Ego and Truth, Personality and the Piaget Paradigm.”)

communication). The enterprising researcher concentrates on some supposed "trait," "drive," or "motive" whose meaning comes to be defined by that which his research instrument quantifies, and whose usefulness comes to be defined by the breadth and nature of its correlations with similarly constructed variables. Does your instrument give you variability across subjects and stability within subjects? Then you're in business — but business is not metaphysics, much less a metaphysics that cheats, and so we are left with a psychology whose gaze is neither out far nor in deep. It neither reaches back to a philosophical source, nor forward to explore the person in his or her organizational wholeness.

A vigorous psychological theory — especially one which passes into our "cultural symbolic" (Rieff, 1966) — usually generates a crystalizing image or scene, some powerful evocation of that psychology's methodology and undergirding epistemology. In 1959, Robert W. White urged a new image to add to that of "the hungry animal solving problems, the child putting his finger in the candle flame, the infant at the breast, the child on the toilet, and the youthful Oedipus caught in a hopeless love triangle." White drew the image he urged from the rich and scientific attentions Jean Piaget directed to children. Piaget's observations yield an image of the child acting dynamically on a world acting dynamically upon him; of a selective, interpretive, directed, constructive, and persistent organism literally "making sense" of the universe; of one who not only changes behavior as a result of experience (the classic definition of "learning"), but changes experience as a result of behavior; as involved, thus, with knowing as with learning; in short, an image of the child as philosopher.

Now Piaget's image has certainly not been ignored. In the eighteen years since White's essay Piaget's influence has grown from that accorded a charming old man sitting on the shores of Swiss lakes talking to children about the wind to that of a man whose program of work is taken as the very guide to universally regular features in intellectual development from birth to adolescence. School curricula and learning settings, increasingly, are organized in the light of his discoveries about the different realities

children live in and construe; and educational goals are partly fashioned in terms of facilitating the development he describes.

Yet eighteen years from now it is more likely that "Piaget" will be "about" "cognitive development" only in the way Columbus is "about" discovering the West Indies, or Newton gravity, or Jefferson reconciling the claims of the individual with the claims of the state, or Joyce a literary approach to consciousness. These are the "problems" that consumed these men, and they resolved them brilliantly, but so brilliantly that the resolutions became Trojan horses lying in wait to reveal what they were really about. Coaxed out of the fortress of our established habits of mind by the interesting figure on home territory, we look into the matter only to have it explode upon us, an army spreading all around, capturing the fortress which becomes figure upon it. What was but a dazzling construction on familiar ground becomes the new ground itself as a new geographic, scientific, civil, or aesthetic grammar is articulated. Columbus' voyage changed the shape of the world. He may have discovered America, but in doing so he caused to be *rediscovered* every other part of the world as well. His discovery, initially of just another "part," was of that extraordinary sort that "re-cognizes" the relationship of the parts to the whole.

What Piaget really studied is the way the changing subject-object differentiations organize and reorganize the person's construction of the physical world. He describes a sequence of balanced structures (or "systems of knowing," or "equilibria" or "stages") which organize and reorganize the physical world by distinguishing between what is subject and what is object in the direction of increasing objectivity. The infant, for example, is adualist; there is yet no differentiation whatever between "self" and "other." Given all we have labored to say about the essentially fictive quality of the "self-other" differentiation, are we not then bound to declare the infant's adualism the truest conception of the world? Is he not *knowing* the oneness we have said hangs continually behind our illusory constructions? It is important to see how he is not. The infant is an adualist not because "self"

and "other" are one, but because he is *all self*." The infant is completely "subjective"; i.e., the entire world is *subject to* his perception of it for its existence—from the point of view of the infant. But this is just the point: the infant *has* a point of view that is "his." Even in an adualist there is a constituted "self" that is knowing the world adualistically. The infant's adualism is not the sort in which one's own and the world's point of view come together, or are completely reversible; rather there is yet no "world's point of view" to be taken at all. The developmental career is the qualitatively increasing understanding of a "world's point of view" for the "self" to take in its knowing of the world. From the point of view of the equilibrative whole—i.e., the universe—each individual developmental advance amounts to more completely joining the world, of more harmoniously integrating it. The way we love the world is by knowing it.²

Sometime in the second year of life such a qualitative development—a subject-object rebalancing—takes place; in this case it is the very creation of the "object" itself; thereby the organization of reality becomes more *objective*. This construction of what Piaget calls "object permanence" (1936)—the recognition that

¹ "Adualism" is a tricky word, and much confusion, particularly "theological" confusion, results from failure to recognize at least three different meanings for "adualism": it can mean "self" and "other" are one; but "all 'self'" (as in Freud's infantile "oceanic experience") and "all 'other'" (as in the popular notion of "transcending the ego") are also "adual."

² This conception of development, then, as an increasing separation of "self" from "other" should not be taken to suggest a steady *withering* of the individual's relationship to the world, but a steady strengthening and complexifying of that relationship by means of seeing more and more clearly what is me and what is not me. Declaring something to be not-me does not eliminate it as an object of attention or affiliation; on the contrary, it *creates* it as an object of attention or affiliation. Piaget's conception of growth as successive "decentering" of "self" from "other" is, thus, not a matter of *separation from*, so much as *distinction between*; not distance, but declension. (If affiliation is literally a matter of "making into a son," then Piaget's conception of growth as decentering is indeed a matter of increasingly extensive affiliation. It is an affiliation, however, from an opposite direction than the one to which we are accustomed. I.e., that with which we become newly affiliated is not a stranger now made intimately familiar, but something which was "too familiar"—i.e., confused with the "self"—now seen as *separate from* but in intimate relation to.)

objects exist independent of my perceiving them — reorganizes the knowing balance in such a way that the world the child construes is no longer subject to the child's immediate action-sensations. The infant adualist knows by its activity in the world. Its mind *is* its body. This is the essence of what Piaget calls the "sensorimotor" stage (1936); it senses *by* action. With the ability that comes in the second year to represent in memory its activity, the infant gets unimbedded from its "motor-sensing" and comes to have what we might call "perceptions." When the pretty ball the eighteen-month-old child was handling is covered with a blanket, he can apparently imagine it still existing under the blanket although he can no longer see it; how else can we account for his deliberate uncovering of the blanket to recover it? Prior to the development of "object permanence" the child ceases to involve himself with the ball when it is covered, not because he just "loses interest" in it (one need only uncover the ball to see that this is not the case), but apparently because *it* loses *existence* for him. What is really happening in this new way of knowing is that rather than being embedded in one's sensing-by-action, being *subject to* sensing-by-action, one's sensing-by-action "moves over" in the knowing-balance from subject to object; one's sensing-action becomes the *object* of one's experience and a new "self," a new *subject* is evolved. Where previously "I" *was* my sensing activity I no longer *am* it; rather it is something I *do* or *have*. What "I" *am* is that which *coordinates* action-memories, i.e., my *perceptions*.

But notice now that there is a new embeddedness. Every developmental advance (and this *is* an advance, not just a shift in balance, because it is a shift in the direction of greater objectivity) is a triumph over the subjectivity of the past, but a constraint of mind with respect to potential advances to come. Hence the three-year-old constructs a world of objects which exist for him or her independently of his or her sensation of them; this much of the "world's point of view" the newly constructed "self" can take. But a measure of that "self's" remaining subjectivity is demonstrated by the fact that the properties of objects are seen to change with one's differing perceptions of them. One is embedded in, or

subject to, one's perceptions, now, as before one was embedded in one's action-sensations. For example, in Piaget's classic study of the conservation of quantity (1937) two identically shaped beakers are filled with equal amounts of water. When the contents of one of the beakers are poured into a taller, thinner beaker (resulting in a higher water level than the remaining beaker) the taller, thinner beaker is said (usually) to have more water. Anyone's first reaction to such an "error" is to pour the contents of the taller, thinner beaker back into the original beaker. When the levels match once again the child will certainly see that the contents of the poured beaker are equal to those of the unpoured beaker. "Yes," the typical child may say, "they are equal — now!" When the contents are poured once again into a shorter, wider beaker, they become less than the contents of the remaining beaker, and so on. Now just what is going on here? Piaget's experiments are so brilliant (Einstein said they were so simple they could only have been thought of by a genius) because they transform such an abstract notion as "structure" or "the subject-object differentiation" into something almost palpable. The child is embedded in his or her perceptions; he is *subject to* them in his construction of reality. Pouring the liquid back in the original beaker does not automatically lead the child to see the error of his ways because he is unable to separate himself *from* his perceptions. They *define* the "self," the subject of one's attentions. But these perceptions "move over" to "other" in the rebalancing or stage change to what Piaget calls "concrete operations" (usually beginning around four to seven years). Now one is able to take one's perceptions as an *object* of attention; no longer subject to them, one can co-ordinate his perception at time₁ with his perception at time₂ and see that the quantity remains the same (or one can co-ordinate his perception of a thinner beaker [therefore less water] with his perception of a taller beaker [therefore more] and see that the changes cancel each other out). As with every rebalancing, what had been taken as "self" is recast to the domain of "other." "I" am not my perceptions; rather, I *have* perceptions; my perceptions become the object of my attention, co-ordinated by what *is* "me,"

the new "self," the new subject of "my" attention. And what that new "self" is — the precise nature of its co-ordinating — is a conservor of the physical world. Its capacity to construct reversibilities of groups and classes permits it to "hold" the concrete world, to know it in its concreteness. The child is now embedded in the concrete.

When the concrete operational child is presented, e.g., with four beakers of colorless liquids and asked to figure out how to make a yellow liquid by mixing some number of some of the liquids, he proceeds haphazardly, hoping to hit upon the solution (Piaget, 1937). There is no "overall plan" in evidence. Or he may be presented, e.g., with a group of metal rods that differ in all possible combinations of material, length, diameter, and shape of cross-section, and be asked what makes one rod more flexible than another. He may experiment and declare that length is a factor, demonstrating his point with a long, *small-diametered* rod and a short, *large-diametered* rod. Asked about the differences in their diameters he is likely to say that he chose them to make more emphatic the effect of differing lengths. Now what is happening *here*? Continuing with our way of articulating Piaget's findings, the "concrete" child has no "overall plan" that constructs all possible ways of mixing the colorless liquids, does not isolate a single variable while holding all other factors constant, because he is *subject to*, or embedded in, the concrete in his construction of the physical world. An "overall plan" that takes as real concrete events which have not yet happened requires a way of knowing the world in which the concrete "moves over" from subject to object of attention. If the reversibilities co-ordinate (take as "object") the perceptions for the "knowing balance" that is "concrete operations," it is the co-ordination of the reversibilities themselves that distinguishes the qualitatively more objective balance that is "formal operations." It is the construction of what Piaget calls the "inverse of the reciprocal," co-ordinating the before-separate reversibilities of the "negation" (which, e.g., co-ordinates time₁ with time₂) and the "reciprocal" (which, e.g., co-

ordinates thinner and less with taller and more), which brings about the new *subject* of the "self's" attentions — the INRC group (Piaget and Inhelder, 1969). This new "self" can now construe the world propositionally, hypothetically, inferentially, abstractly. It can spin out an "overall plan" of which any given concrete event (a combination of beakers, e.g.) is but an instance. Put most simply, this new balance makes "what is" a mere instance of "what might be." This rebalancing, the hallmark of adolescence, unhinges the concrete world (and, necessarily, the old "self" previously embedded in the concrete), and makes the concrete an object of a new "self" which is meta-concrete, meta-physical.

We have seen then, in this new casting of Piaget's findings, how they might be taken to describe a successive rebalancing of subject and object as the person comes to *know* with increasing objectivity the physical world. In sum: it is the rebalancing which "moves" the action-sensing of the infant from subject to object that leads to the first equilibrium, an equilibrium that makes "self" and "world" *subject* to the perceptions which co-ordinate action-sensing; it is the rebalancing which "moves" the perceptions from subject to object that leads to the next major equilibrium, an equilibrium that makes "self" and "world" *subject* to the reversibilities (or "the concrete") which co-ordinates the perceptions; and it is the rebalancing which "moves" the reversibilities (or "the concrete") from subject to object that leads to the next major equilibrium, an equilibrium that makes "self" and "world" *subject* to the hypothetico-deductive (or "the possible"), which co-ordinates the reversibilities (or "the concrete"). The table below — a risky procedure, because it cannot capture the qualities of *process* and *unity* which are essential to a concept of equilibration — schematizes the character of these developments in our balance-striking. In psychoanalytic terms, *every* qualitative differentiation is a correction of something like global introjection; only the newborn is seen to *begin* life in a state of whole-world introjection, and development involves a succession of qualitatively reorganizing discoveries to the effect that I have been defining the

SUBJECT-OBJECT BALANCING IN PIAGET'S STAGES OF
COGNITIVE DEVELOPMENT

Stage	Subject ("structure")	Object ("content")
Sensorimotor	Action-sensations	None
Preoperational	Perceptions	Action-sensations
Concrete operational	"Reversibilities" (the "actual")	Perceptions
Formal operational	"Hypothetico- deduction" (the "possible")	"Reversibilities" (the "actual")

world too much from my own point of view, that what I was taking for me is *not* me, but "other"; a succession of decreasing subjectivity and increasing richness or complexity to the relationship of the "self" in the "world"; a succession that binds growth to truth.

* * *

Obviously these subject-object differentiations have implications for the knowing of the *social*, as well as the physical world. Matters become more complex, however, because the "objects" include persons, and while persons share those constitutive dimensions of spatiality, temporality, causality and materiality with drops of water and long metal rods, they have the additional feature, as we have said, of consciousness. Piaget sees the constructions or equilibria of his stages arising out of the interaction of the constitutive tendencies of the individual and the constitutive tendencies of the environment. These are universal tendencies; every environment is causal. It should be clear by now that there is a danger to Piaget's formulation. It gives an impression of a worldless constitutive human meeting a selfless constitutive world. This now-common way of putting the matter once again makes a cylinder "two ends

connected by a glass tube." The constitutiveness of the "individual" and the "environment" are, in some sense, one. In our own terms, it is not so much the "self" that is constitutive as the person (the "self" is the person's *constitution*) and the person is that unitary equilibrative activity viewed from the perspective of human beings. What distinguishes "personality" from "tree-ality" is precisely the capacity of human beings to construct a "self." Development of social-knowing differs from the development of physical-knowing precisely because the objects of personality's social knowing themselves have personality. Social-knowing theorists (Kohlberg, Selman, Fowler) have perhaps not made as clear as they could what exactly *is* the social analog to Piaget's universally constitutive "environment." Social-knowing development differs qualitatively from (or, actually, qualitatively builds upon) physical-knowing development in that the social environment, in addition to being constitutive in the same ways as the physical environment, is constitutive in the manner unique to persons. The social environment is itself "conscious." Trees "structure back" upon the human being by being spatial, temporal, causal, material; other people "structure back" by being all of these and, additionally, themselves self-conscious construers. This distinction takes on a practical significance when we consider that disequilibrium in social-knowing cannot be looked at only from the point-of-view of a single subject, but must be seen in terms of the social environment's re-cognition (and re-affection!). But the point is made here in order to make clear that development in social knowing, which like all development means an expanding "world's point of view" for the "self" to take, must mean a developing consciousness that the "world's point of view" is itself self-conscious.

This sense of social development as involving a successively reconstructed capacity to take the role of the "other" is at the heart of the work of George Herbert Mead (1934), Lawrence Kohlberg (1969), and Robert Selman (1974). What I would like to do in what remains of this article is indicate how Kohlberg's theory — like Piaget's — can be recast or understood in the context

of this ongoing equilibration and re-equilibration of subject and object. In the process, I hope to be able to indicate, not merely the meta-theory of ego development from a constructive-developmental point of view, but actually to indicate the shape of the several global "ego-balances" along the way. We have suggested that Piaget's program has given us a sense of the person's developing knowing of objects, a knowing oriented to what is *true*. Kohlberg's program gives us a sense of the person's developing knowing of "people-objects," a knowing oriented to what is *right* (moral development). What I think we will see is that Kohlberg's moral knowing is itself rooted in a developing conception of what is true and that it is this bigger context out of which his theory springs that should comprise "ego development" from a constructive-developmental point of view — e.g., the developing knowing of other "selves" oriented to what is true.

Kohlberg's theory of developing constructions of the ethical can be understood, like Piaget's, in terms of a dynamic equilibration of subject and object. Like Erikson's stages, each successive stage is a greater differentiation of that relationship; unlike Erikson's stages it is the process of equilibration itself, the ongoing activity of assimilation and accommodation in the world — not the internal reassignments of binding energy — which is taken to lead to the qualitative stage changes. For the interactionist growth is a consequence of making meaning and not the other way around.

With the concrete operational child's capacity to coordinate his perceptions in space and time (to shift his perceptions from *self* to *other*) comes the Piagetian reversibilities of inversion and reciprocity. These permit me to see, e.g., that the apparently diminished quantity of liquid in the bigger glass is really the same amount because "you can just pour it back into the smaller glass" (inversion) or "the level is lower, but it's also wider, so it's the same" (reciprocity). These operations, or this new equilibration of subject and object, also create the possibility of a similar social construction, for which the prior logical construction would be

necessary but not sufficient (Kohlberg, 1969; Selman, 1974). We can better imagine what this would be by seeing that the corresponding physical reorganization, which permits me to take my perceptions as an object of my consideration rather than as my consideration itself (subject), involves the capacity to *take the role of* my perceptions. Where before the act of pouring the liquid (to continue with this example) was an act with literally incalculable consequences, leaving my interpretation at the spatial-temporal surface (the "apparent" at time₁ and time₂), now my operational organization permits me to "get behind" the data, to "come in" along with it. The social correlate is the new capacity to take the role of another person, which permits me to "get behind" my perceptions of his acts so as to understand, or at least consider, the actor's *intentions* (Selman, 1974). This new capacity is reflected in the shift from Kohlberg's first stage to his second, or in Piaget's understanding of a shift from "heteronomous" to "autonomous" morality (Piaget, 1965). An example of how this shift manifests itself in ethical construction is children's understanding of this type of story which Piaget told preoperational and concrete operational children: one little child was explicitly told by his mother not to touch the fragile cups and purposely picked one up and smashed it to bits on the floor. Another little child was not told anything about not touching the cups, and, to help his mother, tried to carry a tray of twelve cups where she needed them, accidentally spilling all of them to the floor where they were smashed to bits. "Are these children equally at fault?" or "Which of the two children is the naughtier, and why?" Children tend to orient not at all randomly to the story according either to the *result* (the data taken at the surface), or the *intention* of the actor ("coming in" with the data); that is, preoperational children, to the former, and concrete children to the latter. In the social context the ego's knowing activity is inevitably a valuing one as well.

But as every structural-developmental stage is both a triumph over the truth-limits of the prior stage, so it is a constraint of mind with respect to the successive differentiations to come. The con-

crete operational child who has constructed the reversibilities of classes (inversion) and of relations (reciprocity) cannot yet coordinate these two kinds of reversibility to construct the "inverse of the reciprocal" (Piaget and Inhelder, 1969), cannot yet "move" these reversibilities from defining the "self" "over to" an object of the (new) "self's" attention. Similarly, at a socio-moral level, one can take the roles of others, but one cannot coordinate two perspectives each to the other; i.e., one cannot take one's own role from the other's perspective. Until I can do this the "self" is embedded in, and defined by, its own wants or needs. "I" *am* my needs, interests, desires, and other people are seen as theirs. Interpersonal relations are a matter of "deals." Life itself, your life, for example, is of value to me insofar as it is of benefit to me, just as I assume my life is of value to you insofar as you derive some benefit from it. "This is the way the world is."

By way of example, I will report an early teaching experience with seventh graders. I assigned them the much-anthologized short story, "The New Kid," by Murray Heyert (1967). The city block and the nearby playing field form the universe of the story, which opens with the choosing of sides for baseball. This holy ritual is a humiliating one for Marty who is always chosen last and relegated to the outfield. Here the religious exercises continue with his prayer that no ball leave the infield. But, as it happens, the gods do not smile, and at the crucial moment the ball soars toward Marty, who, sprouting extra arms, fails the chance and costs his side the game. As he trudges in from the field, a round of abuse is fired upon him. We get the impression that this is not only an awful experience for Marty, but a rather common one. Some kids are just lucky.

Then one day a new kid appears on the block. He's little. His clothes are too nice. His socks match. There are buckles on his shoes. In other words, he may be more of a wimp than Marty. He is invited to the ballfield and sides are chosen. For the first time Marty is not the least favored. As luck (and artistic license) would have it, the new kid must handle the crucial, last inning

blow. He fails spectacularly — not merely at catching it, but at running after it, grasping it, and throwing it. He is not Willy Mays. He returns from the field with his chin on the ground, and who should begin — who should *lead*, *who should sustain* — the round of humiliating invective, but Marty himself.

Now I asked my twelve-year-old students the moral of this story (though I doubt I used this word), and their answers ran something like this:

The story is saying that people may be mean to you and push you down and make you feel crummy and stuff, but it's not really all that bad because eventually you'll get your chance to push someone else down and then you'll be on top.

From these angelic faces this recurring response flabbergasted me. Not so much because everyone seemed to agree it was what the story was about, but because it seemed no one could even *invent* — even if they didn't believe it — what I took to be the obvious moral of the story. At first I thought they were teasing me, boasting perhaps, acting "hard." "Do you *really* think it was okay the way Marty acted?"

It was more than okay; it was the right thing to do.

It was the only thing to do.

Look, we were sixth graders last year, right? the oldest in the school. We pushed the little kids around. Now we're the little kids and we're getting pushed around. Wait 'til we're seniors! Fair is fair!

It seems clear we are looking not so much here at *what* kids know, but *how* they know. And how the child knows in the balance Kohlberg calls stage 2 does not permit even the possibility of understanding the story as we do. But as persons move out of a concrete operational, non-mutual role-taking world, typically at early adolescence, we would expect them to be able to reject a notion of the right which is itself *founded* on the recognition that each person is his own needs, while at the same time not rejecting an understanding of needs themselves. That which before was the

very context or axis of ought-making is subordinated, made figure instead of ground, reintegrated into a new organization which further differentiates the subjective from the objective. The needs themselves become objective; instead of *being* my needs, "I" *have* needs, as do others. My capacity now to coordinate (integrate) one person's needful perspective with another leads to something quite different than the former dog-eat-dog morality. People are still seen to have their own needs, but, in being able to coordinate one perspective with another, competing needs can be resolved by, and subordinated to, the requirements for maintaining mutual interpersonal relationships, the new social construction of this "self-other" differentiation, and the new subject of attention. The adolescent is thus literally making sense of the interpersonal relationship, whose strictures were before as bewildering to him, as his inability to hold up his end of one was maddening to those who may have thought he was old enough to "know better." Here is a twelve-year-old boy who is just getting hold of this new construction:

[after saying that what is bad is what causes people pain] (Why is causing them pain bad?) Well, that's what I've been taught. Um — some other people have been taught a bit different — that what's bad is to do anything unfair. You know, it's fair to draw all over their things because they'd drawn all over yours. That's good, that's good to do. But I think no matter what they've done to you, it really doesn't matter. The point is that it gets done, so what?

As a child making the same discovery said to Piaget (1948), forgiveness is preferable to revenge, not because of some Sunday School sermonizing, but because "there's no end to revenge."

Measuring Maturation

Myelinogenesis and Brain Function

PETER H. WOLFF, M.D.

Comprehensive accounts of psychological development agree in principle that biology and experience are always reciprocally determined vectors and that their interaction can never be entirely isolated in clinical assessments or experimental design. In the conduct of concrete experiments, developmental psychology is therefore inclined to apply a strategy of "holding one vector constant" while investigating the effects of the other — a strategy which is productive when it alternates between observations on biological phenomena and on the influences of psychological experience to explain behavioral development. In practice, however, empirical research in developmental psychology has generally neglected the biological vector, concentrating almost exclusively on experience as the sufficient cause to explain developmental variations.

Where developmental psychology recognizes biological maturation as an important variable, it has usually applied chronological age as the independent variable, thus making the tacit assumption that maturation is as uniform in its relation to physical time as chronological age. Yet Wohlwill (1973) has persuasively argued that chronological age is an artificial measure based on physical rather than biological time. He suggests that the circular conclusions which result from the use of chronological age as the independent variable of development can be circumvented if we substitute physical or psychological growth measures. Tanner's studies

¹ Taken in part from a report on child therapy from the Mental Retardation Research Center, The Children's Hospital Medical Center, Boston, Massachusetts. Printed by permission of Brunner Mazel, New York.

on physical development (1970) demonstrate how greatly children of the same chronological age may vary in maturational state; and like Wohlwill, he recommends physiological indices of maturity or "developmental age" as the preferred independent variables. Very few biological measures of maturation, however, have been shown to relate specifically to the development of behavior. Skeletal growth curves are a useful first approximation, but their relation to brain maturation is indirect and their relevance for psychological development has been demonstrated only in correlations. Direct measures of human brain growth are not sufficiently precise at present to reveal how the maturation of brain functions determines specific aspects of behavioral development (Purpura, 1973). Despite an enduring debate about the relation between myelinogenesis [sheath around nerve fibers] and brain function (McKhann, Coyle & Benjamins, 1973), central nervous system myelinogenesis probably provides the best overall map of regional variations in human brain maturation that is currently available. The meticulous morphological studies by Yakolev and Lecours (1967) and Rakic and Yakolev (1968), for example, indicate that major inter- and intrahemispheric association pathways do not complete their growth until some time between 4-12 years. Assuming that myelination is an indirect clue to the onset of function, it should follow that maturation influences behavioral development throughout infancy and childhood, particularly as development is influenced by the progressive lateralization of cerebral functions and by increased inter- and intrahemispheric coordinations (Trevvarthen, 1974)....

The study of behavioral outcome after pathological growth retardation demonstrates the interactions between maturation and mental development most dramatically. By itself, however, such evidence does not constitute a secure base from which to draw conclusions about maturational factors in normal mental development. Clinical psychiatry provides many examples where extrapolations from the pathological to the normal case have led us to draw erroneous conclusions. In the case of maturational variations,

such extrapolations may cause us to label as deviant or pathological those normal biological variations which conflict with arbitrary social expectations and motivate us to impose elaborate enrichment procedures in order to homogenize children according to some arbitrary social criterion (Wolff, 1972). We must therefore also find models that demonstrate the effects of maturation on normal behavioral development.

The analysis of behavioral sex differences can, I believe, provide such a model. On the average, girls are physically more mature than boys throughout the period of childhood and adolescence. Although the differences are more evident during periods of rapid growth, such as the prepubertal growth spurt (Tanner, 1970) or the "5-7 shift" (White, 1970), similar sex differences in physical maturity are already evident at birth. Newborn girls, for example, are 4-6 weeks advanced in skeletal age and remain at about 125% of male skeletal age until they are sexually mature (Tanner, 1961). Differences in skeletal or sexual maturation are obviously not direct correlates of sex differences in brain maturation or behavior. The enormous regional variations of normal central nervous system maturation makes it very unlikely, in fact, that any single behavioral or psychological measure would adequately reflect "brain maturation." On a more limited scale, however, Witelson and Pallie (1973), for example, have shown that selected structures of the left cerebral hemisphere associated with language processing are morphologically more mature in newborn girls than boys. From a comparison of sex differences in behavioral outcomes among children with early left or right temporal lobe seizures, Taylor (1969) also concluded that the left cerebral hemisphere matures earlier in girls than boys. Finally Goldman and her associates (1974) observed significant sex differences in behavioral outcome of infant mammals after surgical lesions of the frontal lobes, from which they could infer sex differences in the cerebral maturation of non-human mammals.

The study of human differential abilities provides more extensive but less direct evidence for sex differences in the maturation

of cortical functions. Infant girls as a group attain verbal fluency earlier than boys of the same chronological age and retain this developmental advantage until adolescence (Garai & Sheinfeld, 1968); girls perform better than boys of the same chronological age on tasks requiring verbal fluency or speed and accuracy on automatized motor skills (Broverman, et al, 1968; Wolff & Hurwitz, 1976). Whether such behavioral sex differences are "real" or experimental artifacts, and if real, whether they are biologically or culturally determined remain issues which are actively debated (Maccoby & Jacklin, 1974). Any assessment about the merits of this debate must, however, take into account the behavioral sex differences are very sensitive to developmental effects, some differences decreasing as children approach puberty, others not appearing until the onset of the adolescent growth spurt, still others increasing from childhood into adult life. Many inconsistencies in the experimental literature on behavioral sex differences would probably be resolved if maturational factors and developmental changes were systematically considered in the evaluation of research findings.

The biological basis of behavioral sex differences is demonstrated more clearly on performance measures less confounded by cultural factors. They are reflected, for example, in the separate age norms given for boys and girls on the Lincoln-Oseretsky Test of Motor Maturity (Sloan, 1955), The Bender Visual Gestalt Test (Koppitz, 1964), and many other standardized testing procedures (Garai & Sheinfeld, 1968). Childhood behavioral disorders associated with neurological immaturity rather than neurotic conflict or brain damage, such as language and reading retardation, specific learning disability, minimal cerebral dysfunction, motor immaturity or developmental clumsiness, hyperkinesis and attentional disorders, occur 4-10 times as often in boys as girls (Bentzen, 1963; Eisenberg, 1966; Singer, Westphal & Niswander, 1968). A number of so-called "soft" signs of pediatric neurology are considered normal when they occur in young children and to have diagnostic significance only after a certain age. These dis-

appear significantly later in normal boys than normal girls, and also persist longer in children with minimal brain dysfunction, specific learning disability and hyperkinesis than in normal children (Conolly & Stratton, 1968; Hurwitz, et al., 1972; Wolff & Hurwitz, 1976).

Clinical and experimental evidence converges on the conclusion that specific biological parameters modify the development of normal and abnormal behavioral sex differences and that girls as a group are "programmed" to mature earlier than boys. Yet no comprehensive psychological theory of development has systematically incorporated biological mechanisms which might determine such differences in its explanatory formulations. I suggest that our knowledge about maturational mechanisms contributing to behavioral sex differences is sufficient at present so that studies which "control for" sex differences by limiting the study sample or that "control for" maturational rate by grouping children according to chronological age are likely to miss a crucial determinant of behavioral development.

The indisputable fact of sexual dimorphism does not, however, justify the assumption that males and females constitute dichotomous behavioral types. In cross-sectional and longitudinal follow-up studies, Ljung (1965) and Kohen-Raz (1974), for example, have demonstrated that even within sex the timing of the adolescent growth spurt is closely related to rapid changes of performance on mental tests. Early-maturing girls tend to have a slight but distinct advantage over late-maturing girls of the same chronological age on academic achievement tests (Tanner, 1961); and Epstein (1974) has reported significant within-sex correlations between rapid changes of physical brain growth and intellectual performance during adolescence.

Waber (1976) has added a new perspective to our understanding about the origins of behavioral sex differences, by comparing differential ability profiles in normal early- and late-maturing boys and girls. Early-maturing boys were found to show a typical "female" profile of differential abilities, late-maturing girls a "male"

profile. Group differences in cognition and perception which are generally attributed to sexual dimorphisms may therefore be explained at least in part by the fact that girls as a group mature earlier than boys.

The better performance of boys and men than girls and women on most tasks of spatial visualization, of mental rotation for spatial visualization and of visual or tactile pattern recognition (McFarlane-Smith, 1964; Witelson, 1974) suggests, moreover, that a "general growth factor" is not sufficient to explain the biological contribution to behavioral sex differences. The male advantage on most tests of spatial ability does not become evident until shortly before puberty, but in isolated cases it has been demonstrated as early as 6 years of age (Witelson, 1974). Co-twin variance studies (Bock & Vandenberg, 1968) and family pedigree studies (Hartlage, 1970) have shown that in addition to maturation, genetic factors contribute directly to sex differences in spatial ability, probably as a sex-linked recessive trait. Moreover, Broverman and his colleagues (1968) have shown that circulating gonadal steroids systematically influence the cognitive style of adults and that the same endocrine substance has a qualitatively different effect on males and females. We may conclude that no single mechanisms adequately explain biologically determined sex differences in behavior and that such differences are probably the residues of an interaction among genetic, direct hormonal and maturational factors, which exercise their effect in different ways at different stages in ontogenesis [individual growth].

The relation between brain maturation and behavioral outcome is obviously complex and susceptible to continuous developmental transformations. Any systematic endeavor to examine how maturation, independent of chronological age, codetermines behavioral development must therefore apply psychological measures which are based on knowledge of brain functions from a developmental perspective. Recent advances in neuropsychology have provided one set of analytical tools which, if properly modified for the study of children, should enable us to investigate the maturation of human

behavior in a precise manner. Although most of our information about human brain-behavior relations comes from clinical observations on adult patients with localized cerebral lesions, the concordance between such information and the data from experimental studies on normal children and adults justifies the conclusion that the two cerebral hemispheres are inherently programmed to mediate qualitatively different psychological functions and that hemispheric specialization does not differ quantitatively in children and adults.

Among right-handed individuals, the left hemisphere is "programmed" to process discrete language functions, the sequential features of nonverbal arrays (Carmon & Nachsohn, 1972) and the serial organization of motor actions (Carmon, 1971; Milner, 1972; Ingram, 1975; Wolff & Hurwitz, 1976). In contrast, the right cerebral hemisphere is preferentially organized for processing information in which visual-spatial features, pattern recognition and the instantaneous apperception of spatial relations are prominent. The bewildering array of discrete psychological tasks with a partial hemispheric lateralization which has been collated by experimental neuropsychology in recent years has motivated classification of lateralized functions in terms of functional "modes" rather than specific psychological tasks. Thus the left cerebral hemisphere has been characterized as processing by focal, analytic or serial strategies, the right hemisphere as extracting information by the diffuse, holistic, gestalt mode or by strategies of "parallel" processing (Taylor, 1932; Semmes, 1968; Cohen, 1973). Such characterizations are only a rough approximation of actual conditions, but they have the heuristic advantage of grouping a large number of heterogeneous psychological tasks under a few formal rules and of directing research efforts to a functional analysis of brain mechanisms. . .

The contribution of interhemispheric connections to the development of behavior remains a matter of debate. Kimura (1961) and Sparks and Geschwind (1968) proposed a structural model in which information is transferred between two intrinsically lateralized hemispheres. Kinsbourne (1975) has argued for a less

static model which assumes a bilateral representation of functions, a suppression of function in the "non-dominant" hemisphere by way of the corpus callosum and a fluctuating distribution of attention across the hemispheres according to task demands. Verbal stimuli, for example, bias attention toward the left hemisphere, and this distribution of attention influences the mode in which information will be processed. When task demands exceed the capacity of either hemisphere, a "time sharing arrangement" or activation of both hemispheres may be put into effect (Kinsbourne, 1975). Callosotomized patients, unlike normal subjects, for example, cannot simultaneously perform two tasks that are "lateralized" to the same hemisphere, although they can perform each task separately (Kreuter, Kinsbourne & Trevarthen, 1972). Similarly, when normal children are asked to perform simultaneously two tasks, such as tapping their finger as fast as they can while repeating a familiar verbal passage, the verbal task interferes more with performance of the right rather than the left hand (Kinsbourne & McMurray, 1975). The "overload" phenomenon is markedly reduced in adults but can be demonstrated by increasing the difficulty of the verbal task. The extent of overload by two competing tasks also differs significantly between left- and right-handed adults (Hicks, 1975).

We have examined the development of interhemispheric interactions from a somewhat different perspective by asking children to entrain on the beat of a metronome and to maintain that beat as precisely as possible by tapping with one hand or the two hands in alternation after the metronome is turned off. Right-handed girls show greater temporal precision as well as an earlier onset of manual asymmetry favoring the right hand. Sex differences as well as manual asymmetries on this task disappear between 11-13 years (Wolff & Hurwitz, 1976). On a more complex unimanual motor task, however, adults show the same right-hand advantage and females tap with greater precision than males (Wolff, Hurwitz & Moss, *in press*). Thus asymmetry in motor performance and sex differences in degrees of asymmetry persist into adult life, even when the performance measures by which asymmetry was demon-

strated in childhood no longer show either sex differences or manual asymmetries. . .

In closing, I would like to consider one clinical example which may illustrate how developmental neuropsychology may help to explain the behavioral disturbances of children who come to the attention of child psychiatrists. Many children, and particularly boys, who are of normal or superior intelligence and free of organic or major neurosensory deficits have had the advantage of adequate schooling and were well motivated to learn at least in the early school years fall increasingly behind in academic work because they do not acquire the necessary reading skills. DeHirsch, Jansky and Langford (1966), Bakker (1972) and Satz and his colleagues (1971, 1973, 1974) tested Orton's maturational lag hypothesis for specific reading retardation in longitudinal follow-up designs. The nonreading measures of psychological performance administered in kindergarten were found to be efficient predictors of later reading retardation. Although the kindergarten predictors were no longer discriminating at the time when the reading deficiency became manifest 1-2 years later, more differentiated psychological measures again discriminated between groups. Such findings suggest that specific reading retardation involves more than the inability to read, that the impairment of performance in children with reading retardation reflects a maturational delay which can be compensated in ontogenesis but that the underlying maturational delay can later be demonstrated on more advanced performance measures.

Noting striking similarities in the performance profiles of children with specific reading retardation and adult patients with localized hemispheric lesions of the left hemisphere, Satz further hypothesized that maturational delay in reading retardation may be confined to left-hemisphere-dependent functions. Many children with specific reading retardation, for example, have a history of developmental language retardation, even when they speak normally at the time of school entry (Ingram, 1970); many are delayed in lateralization of function for language processing (Zurif

& Carson, 1970; Lake & Pryden, 1976); and many show a specific impairment on the temporal organization of symbolic elements (Bakker, 1972). The hypothesis that reading retardation is associated with a maturational delay of left hemisphere functions would be consistent with many clinical and experimental observations indicating that retarded readers are specifically deficient in the serial ordering of verbal and nonverbal elements ("left hemisphere" functions), whereas many of the same children are as proficient as normal readers on tasks of spatial visualization or pattern perception ("right hemisphere" functions) (Eisenson, 1966; Doehring, 1968; Bakker, 1972; Ingram, 1975). Since the academic skills which determine success in the elementary schools depend almost entirely on functions preferentially processed by the left hemisphere (Crinella, Beck & Robinson, 1971), it should not be surprising that healthy and intelligent but late-maturing children are at great risk for school failure.

The maturational lag hypothesis has not been critically tested to determine whether maturational delay is entirely susceptible to developmental "catchup." Since many intelligent adults who had severe reading handicaps as children never achieve reading fluency despite extensive remedial tutoring (Perlo & Rok, 1971), one might, in fact, conclude either that remedial tutoring is useless or that specific reading retardation is caused by irreversible lesions of the central nervous system. However, if our earlier speculations are correct that local variations in maturational rate have far reaching effects on the overall organization of behavioral development, one might expect to encounter irreversible variations in the styles of adaptation or preferred modes of processing together with reversible deficits on discrete performance measures. . .

If I have been successful in demonstrating a functional relation between variations of maturational rate and developmental profiles, the demonstration would in no way imply a direct causal relation between biology and specific clinical syndromes in child psychiatry. Reading retardation, for example, may become a clinical psychiatrically relevant syndrome when industrialized society expects its chil-

dren not only to read but also to read at a particular chronological age; or when educational policy equates intellectual competence with performance on tasks that are selectively processed by the left hemisphere. The severe emotional stresses inflicted on retarded readers are obviously not a consequence of biology but the result of society's impatience with, or indifference to, normal biological variations in rates and styles of mental development. The excessive reliance on chronological ages as the independent variable in development must therefore be held responsible for the unnecessary suffering of biologically healthy children who may be slower than their peers but who, like the tortoise, might have won the race in a more supportive environment. Since child psychiatrists neither can nor should interfere with maturational rate, their essential contribution to primary prevention in this example may be to protect children against society's biologically unsound demands that children should conform to the bell-shaped curve and to inform parents, teachers and colleagues about the inherent strength conferred on any society when it encourages individual variations.

THE ROOM WITH THE ORANGE SCREEN

for Victoria Serra

At deer level the colors open.
Where you are painting
the fresh wood parts
sap running
clear as your own veins.
Heart's

a new bird perched & singing
through your rain
wet cabin, universe
in floor & curtains: galaxies
in the folded screen.
You invite sky

through your frame
& the bonded tree of your body's
knowing
to come in as rain does
through alder leaf, fir
needle, & draw your colors

through, markers for a prayerbook
this deer step, star turn, clear
window focusing the light.

KATHY EPLING

TO STAY ALIVE

a man
and a woman
appear
each night
wearing no clothes
carrying small satchels
full of poems
outside the wind hurts
it is january
and strong
they go to the sea
and taste the salt
they go to the market
and trade the salt
for smeits
they go to the bed
and trade the fish
for love
only
the most resourceful
have any chance
at all

ELIZABETH MCKIM

Teaching for Cognitive Development

Intelligence can be taught

ROBERT P. BAUMAN

Major changes in understanding of the educational process have occurred in recent decades. Public and private educational systems have been in turmoil, induced by concern over international competitiveness, racial mixing, sex equality, changing social mores and other factors of direct or indirect consequence to the schools. During this period, increasing numbers of teachers have taken a new look at teaching and learning. Old truths have been rediscovered, new truths have been uncovered, and explorations have been initiated that look promising for future improvements in our ability to educate both young and old.

The IQ Game

For more than half a century, educational philosophy in the United States has been dominated by the underlying assumption of inherent intelligence. Although Binet, who originated the modern intelligence test about the turn of the century, believed that the scores would be influenced by educational experiences, it was soon accepted, especially by American psychologists and educators, that the ratio of mental age to chronological age was essentially invariant with age. Difficulties of measuring IQ were recognized, and this uncertainty provided a comfortable cushion against evidence of changing IQ scores. The major question asked, however, was what fraction of the variance in IQ was attributable to

genetics and what fraction could be assigned to environmental factors. Typical estimates were that IQ was 80% genetic and 20% environmental, with differences in these estimates between different workers at least as large as $\pm 20\%$ of the total variance.

Two quite different approaches in recent years have shot down the conventional model of intelligence. A variety of teaching techniques have been shown to change IQ scores in statistically significant amounts, and a careful review of the research literature on inheritability of intelligence has shown that the earlier research studies were, sequentially, inadequately designed, misinterpreted and misquoted. It seems quite safe and proper to say that, at this time, there is no significant evidence that there is a genetic component to intelligence, whereas there is overwhelming evidence that there are environmental factors influencing measured intelligence. The arguments have been documented in recent publications.

Problem-Solving Skills

In the years following World War II, Bloom became concerned about students who were failing to pass the comprehensive examinations required by the University of Chicago for admission to upperclass status. A small scale study revealed that a major cause of such failures was attributable to poor problem-solving skills. Students would read problems incorrectly or incompletely, would leap to a conclusion without proceeding through a sequence of logical steps that would lead directly to the answer, would give up without trying simple problems because they failed to see an answer immediately, and so forth.

Tutorial sessions in problem solving were conducted, where the *methods* of good problem solvers were compared with the *methods* of poor problem solvers. Practice sessions in solving problems were conducted during the summer before the students attempted the comprehensive examinations again. Performance on the examinations and in courses taken during the following year showed very substantial improvement for the students who participated in the

tutorial program, as compared with students of similar prior performance or similar aptitude who did not participate.

The methods of Bloom and Broder have recently been adapted by Whimbey, and applied by the State of Washington to adult and vocational-technical education programs there. Whimbey's method presents a clear statement of the differences in methods of good and poor problem solvers, then provides a large number of sample problems with solutions characteristic of good problem-solving technique. The prescription for classroom utilization of the material starts with a class-size discussion of techniques, followed by a separation into student pairs. One student acts as the Problem Solver, reading and thinking out loud as he attacks the problem. The other student, the Listener, has the responsibility of ensuring that the Problem Solver verbalizes all steps, watching for inaccuracies of reading or logic, and eventually helping the Problem Solver to analyze errors that have been made during the solution process. The students alternate Problem Solver and Listener roles on successive problems. The solutions written out offer guidance to the student pair as necessary.

Fun and Games

A very different approach to improving intelligence and school performance has been taken by Layman Allen and his associates. The first production was the WFF'N PROOF game, based upon the concepts of symbolic logic. This was followed by EQUATIONS, ON-WORDS, other games designed to stimulate thinking. The games are of the non-simulation type, meaning that they are not like chess or Monopoly, which simulate war or real estate speculation; instead the important rules for EQUATIONS, for example, are the rules of arithmetic. Although there are some aspects of strategy in the conduct of the game, the emphasis is always on real mathematics and what can and cannot be accomplished with the resources at hand. Because all players have the identical resources available, chance is nearly eliminated as a factor in determining the winner.

Classroom studies of WFF'N PROOF and EQUATIONS have shown that they serve to improve student interest and therefore markedly decrease absenteeism, and also produce mental development as shown by conventional measures. For example, in one summer program of 60 contact hours (four hours per day, five days a week, for three weeks), the average gain of the adolescent students on the non-verbal California Mental Maturity test was 20 points. Other studies have analyzed the nature of the gains in more detail.

Piaget

A major influence in current educational thought is the model of cognitive development described by Jean Piaget in his writings of the last half century. There are several important features of Piaget's observations. Perhaps the most important is the recognition of specific stages that each individual passes through, in the same sequential order though not necessarily at the same rate. Starting with the sensori-motor stage, from approximately birth to age two, in which the infant interacts with his environment only through direct stimuli of touch, sight, sound, etc., the progression is to a pre-operational stage, which will typically last from about age two to age six. In the pre-operational period a child can deal with real objects, even when they are out of sight, but cannot carry out mental transformations on such objects. For example, the child at this stage cannot imagine how a specific scene would appear from a different perspective, cannot describe the sequential stages of a falling, rotating pencil, and does not recognize the relationships between the direction of a liquid surface and the horizontal, in a tipped bottle, or between a chimney and the slanted roof. Counting skills are acquired, but numbers are not manipulable as abstract quantities.

During a period that may be described, for purposes of discussion, as extending from about age 6 to age 12 or 15, the child is concrete operational. At this stage, mental operations become possible, and abstract quantities can be handled in limited ways. Arith-

metic operations of addition, subtraction, multiplication, and division may be mastered. Concepts of rates are understood. For the first time, cause and effect relationships are distinguished from simple associations. Elementary concepts of area and volume are acquired, but not to the extent that the differences in units are understood.

The stage of adult-like thinking, which is expected to appear in the early teens, is called formal operational. Initial signs of reaching this stage are a grasp of ratio and proportion. Other aspects are a facility in dealing with reversibility and compensation (as in double negatives and in product functions such as a balance beam where a decrease in weight is compensated by an increase in distance), understanding of variants and invariants (as in planar figures where the perimeter may be invariant but the area dependent on shape, or the invariance associated with the additive properties of volumes), and an ability to deal with relationships between abstract quantities. It is at this stage that algebra first becomes meaningful, cause and effect are grasped sufficiently that the nature of proof may be understood, and the ability to separate variables in a multi-variable problem becomes evident.

Comparison of the Piagetian stages with traditional academic curricula shows a remarkable correspondence between the expected ability levels of the child and the demands put upon the child by the traditional program, developed by trial-and-error methods over many decades. Students who did not progress according to these expectations dropped out of school or dropped from college-preparatory course sequences into more vocationally oriented programs. Thus only those who fit the expected pattern were likely to find their way into the major colleges and universities.

Another important finding of Piaget was that mental growth, or cognitive development, is caused to a significant extent by social interactions. Disagreement in interpretation between two individuals causes one or both to reconsider and to develop new mental models for understanding the phenomenon at issue. Cognitive de-

velopment occurs at the frictional interface between conflicting ideas.

Examples of the importance of social interaction on cognitive development abound in history and sociology. Stone age men had, in general, a very inadequate concept of cause and effect, accepting explanations for astronomical and meteorological events that seem strange today. Similarly, in cultures today in which there is minimal education, there are typical patterns of acceptance of magic, absence of long-range planning (which requires looking at relationships between intangible, or abstract, quantities), and minimal mathematical skills often limited to counting and the most rudimentary arithmetic.

Cognitive Development in the School Population

Although Piaget's studies showed that adolescents typically became formal operational at age 12 to 15, more recent studies have shown that these expectations are not fulfilled for American or British school children. A few students make the transition by age 10 or 11, but only about 40% have progressed beyond concrete operational by high school graduation. Unfortunately, college courses seem to have little effect on the proportion of formal operational vs. concrete operational thinkers.

The discovery that many post-adolescents do not test as formal operational raises questions concerning the validity of the classification scheme for older students. Are the concrete-operational and formal-operational labels meaningful for 18-year-olds or for older adults? Because Piaget worked only with individuals below 16 years of age, his analyses provide no direct clue.

Arons has observed that the learning patterns of adults are quite similar to those of children when faced with new experiences. Renner and his associates have applied Piagetian tests to high school and college students and found patterns consistent with concrete operational and formal operational stages.

Current Studies

To check more explicitly the validity of Piagetian stages for young adults, a clinical-type study was undertaken in which a wide variety of test questions were given to a small group of students on a one-to-one basis. Quite often during the study it appeared that a student had answered a question that was beyond his apparent development stage, or had failed to answer correctly a question that was within his expected range as judged from other questions. In every such case, without important exception, further questioning revealed the student had been guessing, or that the student could solve the problem. That is, the results were fully consistent with the assignment, to each individual, of one or another single Piagetian stage (including rough sub-stages between concrete operational and formal operational). Although the testing program was less complete for the few much older persons interviewed at the same time (approximate ages 30, 55, and 65), the results for these people also seemed consistent with the model.

A by-product of the clinical study was an observation that the Piagetian stage correlated remarkably well with performance in a concurrent physics course for several of the students. There were serious deficiencies in the experimental design of this part of the study, however, for the course grades were assigned by the investigator. Therefore a separate analysis was conducted for approximately 30 students who were not known to the investigator. On the basis of paper and pencil tests of Piagetian level, administered by third parties, predictions were made of expected grades for the students in a physics course. Class records were then checked to see which of the students had subsequently taken a physics course and predictions were compared with actual grades earned. The correlation was remarkably high, suggesting strongly that the developmental stage of the student on entering the physics course was the primary factor determining the grade earned.

Stimulation of Cognitive Development

The separate pieces of the puzzle of cognitive development and intelligence now seem to fit together, with important implications for teaching. There is reason to believe that success in school is determined, to a significant extent, not only by "intelligence," as measured by standard tests, but by the cognitive development stage as measured against Piaget's model. Furthermore, there is good evidence that intelligence in general, and cognitive development in particular, is primarily (if not entirely) a consequence of environmental influences. Also, preliminary studies seem to show that individuals lie along the same linear development track, as suggested by Piaget's studies of children and adolescents.

The implication seems clear. If our students (young and old) are not as far along the track as we would like, but are still on the track (and there is no evidence of individuals having jumped the track), and if progress along the track is determined primarily by environmental factors as accumulating evidence would indicate, then it becomes a responsibility of teachers to provide appropriate environmental influences to move students further along the track of cognitive development. We can no longer justify a process of screening students according to the levels they have achieved and discarding those below some cut-off level.

The key question then becomes how much a teacher can do to change the cognitive level of students. Is it possible to make bright students out of dull students? The question usually generates heat, but there are few specific answers available in the literature. It was in large part to obtain an answer to this question, of whether teaching can be effective, that some experimental courses have been designed and initiated at the University of Alabama in Birmingham.

Three courses, or course-sequences, have now been initiated. The first, designated PHYSICS 10, Mathematical Preparation for Physics, is a one-quarter course, carrying three semester hours of credit. It is fully self-paced, allowing students to complete the work in less than a quarter (although few have done so) or over

a period of two or more quarters. The course has been required for those students who wish to enroll in a physics course but cannot pass a screening examination that tests primarily for elementary mathematical skills. It is also elected by some students to satisfy general degree requirements in science, or as preparation for courses in other areas.

The second course was a summer cognitive therapy program for incoming college students of marginal ability, as measured by high school grades and ACT scores. During the summer quarter, of ten weeks, the students met four hours per day, five days per week. Six hours were devoted to English, in small class sections, with emphasis on encoding and decoding of ideas (getting an idea into English or abstracting thoughts from English). Approximately four hours per week were devoted to problem-solving skills and early units of the PH 10 course. Two hours per day were devoted to playing games, including EQUATIONS, WFF'N PROOF, and ON-WORDS. The program was supported by a Teaching Improvement Program grant, from within the University.

The third course sequence, arising from the other two, is a three-quarter sequence, primarily for freshmen, based largely on problem-solving skills, PH 10 material and the games. This sequence, designated PHYSICAL SCIENCE 7, 8, and 9, is combined with a strong counseling program and, for most students, enrollment in the standard freshman English course that provides remedial help for those who require it. The program is supported, in part, by a Special Services grant from the Office of Education, DHEW.

The Foundation Course, PH 10

Piaget has observed that the several stages of cognitive development must be achieved sequentially. It seemed appropriate, therefore, to design a cognitive development course such that it would start with the most basic levels expected for the student popula-

tion, working upward toward the level required for success in physics courses, and then allow students to progress through the material at their own pace. The first unit deals with counting, followed by units on addition, subtraction, multiplication and division. Emphasis is not on drill, but rather on understanding the structure of the relationships. Unit 6 offers practice in multiplication by requiring the students to count the number of possible arrangements of objects under specified rules. For example, given 4 objects, in how many different orders can they be arranged (N factorial, or 24), or, by taking some, none, or all, how many different combinations could be achieved (2^N , or 16). The emphasis is on counting available choices at each stage, then combining those numbers. Test questions require development of variants to account for indistinguishable objects.

Subsequent units cover punctuations and graphing, implication (see below), units and dimensions, powers and roots, number bases, equations (including solution of quadratic equations), multiplication and factorization of polynomials, and conjunctions and disjunctions in elementary symbolic logic.

The last third of the course leans more toward specific areas related to needs in physics courses, including significant figures, series and approximations, kinematics (time-rate-distance and acceleration problems), a review of plane geometry, trigonometry, complex numbers, matrices and determinants, and vectors.

Initially the last unit of the course was the EQUATIONS game; the students played several games with each other, and all seemed to be favorably impressed. In an effort to decrease the volume of material, and make room for problem-solving skills, the game has been dropped and two of the later units made optional.

We now have the students go through about one third of Whimbey's workbook on problem-solving skills early in the course, working in pairs. The reception for this material has been very good. It seems particularly effective in making students aware of their own thinking processes for the first time (a characteristic of the formal operational stage), thereby immediately affecting thought patterns in other courses.

One of the early surprises came with Unit 8, on implication. Bereiter and Engelmann had observed that disadvantaged preschool children could quickly learn to deal with simple implication statements, such as, "If it's red, it's round." It appeared reasonable, therefore, to ask college students to deal with such statements. It was discovered, however, that when all eight variations of a simple implication statement were written out, including negatives, none of the students could readily distinguish those that did or did not follow as true or false from the original statement and those that were undetermined. The ability to understand such problems and to convert statements in English from other formats into standard implication form ("If . . . then. . .") is further tested by Unit 14, where conjunction ("and") and disjunction ("or," in the meaning "and/or") are introduced. At the end of this unit the meaning of "if and only if" becomes clear to most students for the first time.

Probably the most important characteristic of the PH 10 course is not the specific material in the workbook, but rather the way in which the course operates. In the workbook and on the unit tests, the intent is to ask hard questions about easy material. Emphasis is on making students explain how they know answers. For example, the unit on counting begins with a definition of the number of objects as the largest number reached in counting, taking each object once, which is followed by an axiom that the number is invariant to the order of counting. Students are then given the "game" of showing a child he has 11 fingers (count on one hand: 10, 9, 8, 7, 6, and add the five fingers of the other hand: $6 + 5 = 11$). The student is then asked to explain two aspects: first, why he knows that the error is not simply in the order of counting (which requires only a restatement of the axiom already given), and second, how it can be shown that the method is not as close to "correct" as it seems (for example, by breaking the count at another point, thus getting an odd number greater or smaller than 11).

The Workbook has many places for answers to be filled in, and these are checked, often with verbal questions asked by the instructor about the material. When the unit has been completed,

the student receives a unit test (generally one of three or more versions) as an open-book test. The unit tests are of sufficient difficulty that they are most often not answered fully correctly the first time. Errors are indicated, and the tests are returned to the students for correction. No record is kept of student mistakes; only satisfactorily completed tests are recorded. The student works on only one version of the unit test, but must get it right.

There is a great deal of student cooperation in the class, but a surprisingly small amount of simply telling answers. It is a common occurrence to have several students stand quietly by, with subdued smiles, listening to another student struggle with a problem others have all previously solved.

Student response to the course varies, but there is also a great deal of uniformity of attitude. A typical comment would be, "I'll sure be glad when I get through this course. It's an awful lot of work. But I enjoy it, and I've learned more from this course than from any other I've taken." For the instructor, it is rewarding to see students in the later stages solving problems that they could not have grasped a few weeks earlier.

A final examination is given as a closed-book test. It may be retaken (in an alternate version) as many times as desired, but in recent quarters no student has taken the exam more than twice. Most students manage to achieve an A or B on the first or second attempt, which is sufficient for an A in the course if all units are completed. Colleagues, who are often most difficult to convince concerning academic level of a remedial program, have uniformly agreed that the final examination is tough.

Summer Cognitive Therapy Course

Probably the most striking feature of the summer course, in retrospect, is that we discovered, during the summer, that the really slow students we had taken into the program were an exceptionally bright group of exciting youngsters. Examples of initial difficulties are that none of the students recognized on the first day that $1 \div 2$ was the same as $\frac{1}{2}$. (Some thought it was 1, some

said 2, and one carried out the division process and answered 5.) Several students could not solve an equation, such as $3x = 5$, for x . Mathematics ACT scores seem to have been randomly scattered about the value expected by pure guessing.

After a period of concentrating on the Whimbey problem-solving materials, the students worked through the first eight units of the PH 10 workbook. Not all completed that much (one student completed no units), but most were at the point of beginning to master the implication statements. Graphing was a particularly difficult unit, leading us to prepare introductory material for that section for subsequent classes.

The games were operated as tournaments, students competing against others of matched ability at each table but operating as teams, each team matched as closely as possible with the others to include all levels of ability. At the end of each set of games, the winning student moved up one table, the loser moved down one. EQUATIONS provided practice in elementary arithmetic and later introduced powers and roots. WFF'N PROOF further emphasized the mental manipulation of relationships, and the need for looking at alternative solutions and the need of each to check his own work because others are waiting to challenge any mistakes. ON-WORDS was played on Wednesdays for variation but also to sensitize the students to vocabulary, and incidentally to spelling skills.

The primary early measure of success was the ACT examination, given at the end of the summer and compared with pre-entrance scores. Original plans were to have 30 students, but some students did not appear and were not replaced. Approximately 24 students did participate, of whom 20 stayed through the quarter. Several of these were absent as much as half of the time, and were therefore excluded from the analysis. Thus 14 students could be compared for ACT pre- and post-tests. The scoring process included an adjustment for the maturation normally expected between test dates. Increases in means were as follows: English, 1.4; mathematics, 1.7; social science, 0.2; natural science, 3.9; and composite, 1.9.

Gains in English were almost significant at the 5% level ($t = 1.99$ vs. 2.16) for a two-tailed distribution. Gains in natural science ($t = 3.27$) and in the composite score ($t = 2.82$) were clearly significant. Considering the small number of students for statistical analysis and the limited time of nine weeks to work with them, these results were encouraging. The changes in student attitudes and self-confidence were not measured but were striking.

Academic Year Program, PHS 7-8-9

Most students have agreed that the PH 10 course, although very helpful, comes too late for maximum efficiency. Most of the students have taken algebra and pre-calculus courses, and perhaps a third have had one or more calculus courses. The summer program was effective but was too short and was expensive in its experimental form. What is clearly needed is a program that will meet the needs of incoming freshmen, of all academic major areas, within the context of traditional course, tuition and staffing patterns. The PHS 7-8-9 sequence is a close approximation to that goal, although it must still be considered experimental in some minor respects.

Students enroll in PHS 7 as a three-semester-hour course, but are assigned also to a laboratory period following the class period, which is devoted to the games (e.g., EQUATIONS) and other special activities. With an opportunity to deal with the same students, in PHS 7, 8, and 9, over 9 or 10 months, instead of 9 or 10 weeks, there is an opportunity for much greater effect.

Students will go through the Whimbey problem-solving material, most of the PH 10 workbook units, and in addition do a few simple laboratory exercises involving measurements (in the classroom) and learn some supplementary study skills. One full time instructor is assigned to the 100 students, in three sections of approximately equal size, with one graduate student assistant (approximately 20 hours per week). Another weekly period is set aside when all the students may be brought together for counseling or for testing for documentation purposes on the program. A senior faculty member is available as a consultant.

Summary and Conclusions

There is ample evidence that our educational system has been more effective in awarding diplomas than in maintaining the standards of education expected of our schools. Such evidence includes the drop in standardized test scores at the national level, less publicized drops in performance on examinations used over a decade or more by individual institutions, and the observation that a majority of students entering college are not fully formal operational, although most college textbooks are written for students who are at this upper level of development.

Evidence has also accumulated that the ability to handle academic material is not inherited, but must be learned. Almost as a rearguard action to protect teachers from responsibility for poor student performance, it has been suggested that there is a critical age, beyond which little or nothing can be done to help retarded children. However, the advocates of such an assumption have been unable to agree on whether the magic age is 1 or 3 or 7 or 14, and reports in the recent literature do little to support the hypothesis for any age. The alternative conclusion seems to be that teachers do have a responsibility for the intelligence of students leaving their classes. The studies reported here, though limited in scope, lend direct support to the interpretation of intelligence as something that can be learned in a classroom setting.

Remedies for current difficulties are not likely to come easily. Many of the techniques that we have tried and found successful are capable of being applied in elementary and secondary schools. For example, Professor Allen has initiated a highly successful adaptation of the EQUATIONS game in school systems of Detroit and Ann Arbor, and Whimbey's material is almost independent of the instructor. Nevertheless, leading students to develop formal operational thought apparently requires an instructor at that level, and many of the elementary and secondary teachers graduated in recent years by our colleges and universities are concrete operational or in early stages of transition toward formal operational.

What can be done now is to further explore the ways of raising student intellectual levels and take steps to ensure that all future graduates, not just those in selected disciplines, have been exposed to courses in which serious thinking is required. If proper steps are taken to raise the cognitive development level of students entering college, it will be possible to re-establish the intellectual levels of college courses without excluding a majority of our students from those levels.

Appendix

Perhaps some feeling for the content of PH 10, and thus indirectly of the way in which students are led to develop new thought patterns, can be obtained from a few sample questions of the type contained on the unit exams. The unit in which these questions appear is indicated by the Roman numeral preceding the question.

IV.

If zero stands for "nothing," how could you justify putting units on zero?

Mortimer wrote a check, then discovered that his bank balance was overdrawn, showing a balance of $-\$5.00$. He didn't worry, however, because he had learned in school that two negatives makes a positive, so he simply wrote a check for $\$5.00$ and cashed it to give another overdraft of $\$5.00$. Explain, for Mortimer, how his logic went astray.

V.

If y is proportional to x , doubling x will always double y . What will be the characteristics of the graph of y vs. x ?

If a 10" pizza costs $\$1.00$ how much should a 12" pizza cost?

VI.

If you are given one bag of blue marbles, one bag of green marbles, one bag of yellow marbles, and one bag of red marbles, how many (distinguishable) ways could you put one marble into each of 5 boxes? _____ Explain.

How many two-letter words are possible in English? _____ Explain (Possible words include aa, ab, ba, etc.)

If you are given one blue ball, one green ball, one yellow ball, and two red balls, how many (distinguishable) ways could you put one ball in each of 5 boxes? _____ Explain.

VII.

A cube is 3 ft. on a side. How would you cut a cubic piece from it that would give you $1/64$ of the total?

VIII.

Given the valid statement, If it changes its speed, it is accelerated; which of the following are necessarily true, which are necessarily false, and which are undetermined.

If it changes its speed, it is not accelerated.

If it does not change its speed, it is accelerated.

If it does not change its speed, it is not accelerated.

If it is accelerated, it changes its speed.

If it is accelerated, it does not change its speed.

If it is not accelerated, it changes its speed.

If it is not accelerated, it does not change its speed.

Express the following statements in "If . . . then . . ." form. Assuming the original statement to be valid, give a variation that will necessarily be true and two variations that will necessarily be false.

Patriotic Americans like apple pie.

It is always warm in summer.

An object slows down only when acted on by a force.

The best team will win Saturday.

Only reptiles are snakes.

X.

Given that $(n^p)^q = n^m$, what is m^2 _____ Check your conclusion by substituting numbers.

$$27^{2/3} =$$

$$9^{5/2} =$$

$$\text{Is } n^{(p^q)} = (n^p)^{q^2}?$$

XI.

Express the base 8 number $(26/6)$ as a binary number.

Express the base 8 number sum $(6 + 23)$ as a base 12 number.

XIII.

a. Find the first 5 terms of $(1 + a)/(1 - a)$

b. Evaluate $101/99$ to three significant figures (without dividing!).

Show your work.

XVI.

Estimate: $\sqrt{65}$

$$\sqrt{10}$$

Given $\ln 3 = 1.099$, find $\ln 9$

$\ln 10$

Estimate: $e^{.02}$

$$e^{-.03}$$

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ARTICLES

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ANNA GLUMICICH, an eleventh-grader at Andover, lives in Wilton, New Hampshire.

JAMES LOMBARD attends Philips Academy from Chappaqua, New York.

An eleventh-grader at Andover, KRISTIN TIMKEN comes from Canton, Ohio.

POEMS

DIANA DER HOVANESSIAN works as a poet in the Massachusetts schools (Newton, Quincy, Cambridge) giving student and

teacher workshops. Her poetry has appeared in American Scholar, American Poetry Review, The Nation, and The Paris Review. An anthology of Armenian poetry translated by her will come out in 1978 (Columbia Univ. Press).

KATHY EPLING lives in northern California with a basset, a pregnant cat and a three-month-old son, Garth. She works at the Orange Cat Goes to Market bookstore.

RICHARD GROSSMAN's work in this issue is part of a 500 poem pastoral, The Animals. Other poems from the collection have appeared in The Southern, Paris and North American Reviews, Poetry Northwest and the Carolina Quarterly. His book on his career as a businessman, Tycoon Boy was published earlier this year by kayak.

PHYLLIS JANOWITZ recently won the Associated Writing Program Poetry Competition for her collection The Rites of Strangers, which will be published by the University Press of Virginia.

SUSAN (BARTELS) LUDVIGSON has published poems in The Nation, The Paris Review, Southern Poetry Review and The Georgia Review. She has published one book, Step Carefully in Night Grass (John F. Blair, Publisher, Winston-Salem, 1974), and teaches in the English Dept. at Winthrop College in Rock Hill, S.C.

ELIZABETH MCKIM works with people of all ages running poetry workshops throughout Massachusetts. She also teaches a poetry workshop at the Arts Institute of Lesley College. Her poems have appeared in many magazines, and her first book, Burning Ththrough, will be published by Wampeter Press in May.

MARY OLIVER lives in Provincetown, Ma. She has published three collections: No Voyage and Other Poems; The River Styx, Ohio; and The Night Traveler. In 1972 she received the Shelley Memorial Award, and she has also been awarded a National Endowment Writing Fellowship. Recent work has appeared in Ironwood, The Ohio Review, Atlantic Monthly and Commonweal.

DEC 11 1978

The Andover Review

A JOURNAL FOR SECONDARY EDUCATION



Fall 1978

Learning in Adolescence II

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THIS ISSUE, as has been the case with many before it, bears the unmistakable imprint of Christopher D. Kirkland. He has been a member of the board from the first issue. He now leaves for other activities in other places. The magazine will miss his imagination and inventiveness, his vigorous editing, his contributions and those he gained from others.

Herewith is the second issue devoted to the symposium on Learning in Adolescence, the aftermath. Among the most provocative of the discussions within the symposium were those of the scientists and their concern with the cognitive development of the adolescent. It is therefore appropriate that we should lead off with Arnold Arons' succinct statement on modes of reasoning, followed by Christopher Kirkland's demonstration of how these find their way into his classroom. Robert Kegan's article is a reflection of another line of inquiry — the interrelationship of the young and the adult, a call for affection and love. Denis Phillips reminds us of the pitfalls of psychological research and findings. Elise Pachter, though not a participant, gives us an insight into how the late adolescent pictures herself or himself, a view notably lacking in the symposium and therefore welcome. Joan Lipsitz explores the phenomenon of hunger, which we touched but is here developed in a forceful way. Peter Farrow demonstrates that he is more than the maker of telling drawings. His anatomy is not easy to follow but will more than repay the careful reader. Thus, by chance or by design all three of the sub groups of the symposium are represented. It is impossible to encompass a wide-ranging discussion of three days in one issue. However, Kirkland taped and has transcribed all the discussion; these transcriptions should be available soon for those who are interested.

None of this would have been possible without the support and encouragement of the Ford Foundation and the William T. Grant Foundation. We are most grateful to both.

Grateful as we are, we now turn in our next issue to more general matters and continue our inquiry into secondary education. As always we welcome reaction to articles already published or any inquiry which bears upon the central concern of this magazine.

The Editor

THE REVIEW invites articles, poetry and graphics from all quarters and will select material with concern for secondary education. If mailed, graphic work should be insured by the sender. It will be returned in due course in the same manner.

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A JOURNAL FOR SECONDARY EDUCATION

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The Editor
The Andover Review

As for the Symposium, let it be said that we groped the beast, shinnied its leg, wresdied its trunk, spliced its tail, balming with *bonhomme* the chafes of diametrical cognitions: Sizer insisting on many elephants, Brown on metaphoric ones, Bauman and Arons on neat unwrinkled ones, and so on. Remarkably, the Symposium produced but two casualties: The Jacklin Hypotheses, which, being restricted to female elephants only, were deftly tabled, and the Proofs of Opposable Thumbs (advanced by some odd old ducky from Maine) which were withdrawn on discovering that he had been groping not an elephant but a physicist.

As for myself, I thought it best to let my colleagues have their little day since, sooner or later, they all must come round to the only possible *correct* conclusion — mine.

For the elephant, especially between 14 and 18, is wall, all wall and nothing but wall — against which we are every damned one of us up.

Peter Farrow

Reasoning Modes and Processes Arising in Secondary and College Level Study of Natural Science, Humanities, and the Social Sciences

ARNOLD B. ARONS

This paper is an outgrowth of discussions taking place at the Andover Symposium on Learning in Adolescence within the sub-group that concerned itself with the problem of advancement of cognitive development. The basic list of reasoning modes and processes was generated in the course of the discussions. Additional details of illustration and interpretation are the personal contributions and opinions of the author.

One component of the broad problem of Learning in Adolescence is the question of intellectual growth and development, and an intrinsic aspect of the latter is the development of the capacity for abstract reasoning. In an effort to achieve a higher degree of specificity in its discussions, the symposium team that concerned itself with the problem of advancement of cognitive development attempted a listing of some modes of reasoning and

levels of awareness of one's own thought processes that are either tacitly taken for granted or need to be consciously developed in secondary school and introductory college instruction. Without pretence to completeness and without implication of strict hierarchical ordering, a tentative list emerged as follows:

Recognition, identification, and control of variables.

e.g., recognition of the possible influence of length, thickness, and material, and control of two of these variables in establishing the effect of the third in the well-known Piagetian task of bending rods; recognition of economic, military, political, or social factors in an historical problem, and, in the information available, discerning whether conclusion as to cause and effect relationship is possible or whether the variables are so confounded as to preclude a reliable conclusion.

Elementary propositional logic

Syllogistic (if . . . then . . .) reasoning involving one or two steps. Forming and understanding statements involving inclusion, exclusion, and serial ordering. Correctly interpreting syntactical subtleties such as double negatives, subjunctive mood, etc.

Reading a paragraph of text and re-stating its content and meaning by translation into one's own words.

Awareness of gaps in knowledge or information:

Recognizing when one does not understand the meaning of a word appearing in an oral presentation or passage of text and sensing the need of establishing its meaning.

Recognizing incompleteness of information in a particular context and realizing that a definite conclusion cannot be reached, or realizing that conclusions or decisions are being made as best they can in the face of incomplete data and qualifying the results accordingly; i.e., developing recognition and tolerance of ambiguity.

In a given sequence of development, recognizing what has become known and established at a particular point while also recognizing what questions still remain unanswered or even anticipating some still to be asked.

Giving clear operational definitions of terms or concepts, recognizing the necessity of using only words that have prior definition, and being aware of the appeal to shared experience in the shaping of definitions.

Doing arithmetical reasoning involving ratio, proportions, and the consequences of the process of division.

Translating words into symbols and symbols into words.

e.g., translating a verbal problem into the symbols of algebra or arithmetic or into a graphical representation; translating a graph or other graphical or diagrammatic representation into words, and extracting all of the content and implications.

Discriminating between observation and inference.

e.g. In a scientific context, recognizing in a text presentation or in laboratory work the observational, empirical, or experimental facts that are available and separating these from the concepts that are formed or inferences that are drawn from the facts. Recognizing the difference between analysis of the structure of a poem and an interpretation of the poem. Recognizing the difference between historical data and the historian's interpretation of the data.

Drawing inferences from data or evidence.

e.g. From observation of lunar phases and the position of the moon relative to the sun, drawing the inference that moonlight is reflected sunlight. Given the code of Hammurabi inferring from this code of laws something of how the people who generated it lived and what they held to be of value.

Following the inductive reasoning pursued in the generation of a model or a theory; using deductive reasoning to test the validity of a model or theory and to extract predicted consequences or explanations.

Doing hypothetico-deductive reasoning.

e.g. Visualizing, in the abstract, the outcomes that might stem from changes imposed on some given system or situation, whether

it be in scientific, literary, historical, economic, social, or political context.

Developing self-consciousness concerning one's own reasoning and reasoning processes.

e.g. Being explicitly aware of the mode of reasoning being used in a particular situation. Consciously seeking to transfer to new or unfamiliar situations modes of reasoning that one has confidently used in more familiar contexts. Attacking a new problem or unfamiliar situation by asking oneself questions formed from the simplest and most concrete aspects that seem to underlie the situation.

Invoking combinations of the preceding modes and processes in the solution of problems in various subject matter areas.

The following qualifications accompany the preceding list: We tried objectively to isolate and describe reasoning *modes* and *processes* as well as levels of awareness that we see to be inextricably associated with clear thinking and with genuine understanding in various conventional subject matter areas, and, in particular, to detect processes that are common to different areas. Thus, although all the modes listed arise in the study of science, they are by no means limited to science and are also essential in at least some aspects of the study of humanities and the social sciences. In this sense the list is a description of *goals* — of capacities it is desirable that students develop as they study and learn — and not a prescription of ways of attaining the goals. It is suggested that questions as to differences in cognitive modes and styles, as well as differences between sex and ethnic groupings, arise not with respect to the reasoning capacities to be attained but with respect to the *ways* that lead to attainment. It is with respect to these ways and procedures that we need be sensitive to matters such as styles of learning; balance of verbal, visual, and auditory modes with respect to individual differences; subject matter areas most suitable as starting points for different individuals; volume, pace, and level of material that various individuals can handle.

In recent years, administration to college and university students of typical Piagetian tasks characterizing attainment of formal operations has revealed that at least fifty percent, in the broad cross section, fail completely in the performance of the tasks or perform them with only partial success. In general, these tasks probe only a few items among the capacities cited in the preceding list and do not at all probe the more sophisticated verbal-linguistic aspects. Inquiry among secondary and college teachers usually yields quick, subjective denial that many students exhibit these capacities. Yet much of the material and instruction with which we confront students in most subject matter areas implicitly assume that the capacities are either already present or that they will automatically evolve with time and with study of the subject matter.

It is becoming embarrassingly clear that such development actually occurs in only a relatively small proportion of our students — perhaps the upper twenty-five percent, those whom we characterize as among the “brightest.” The remainder, who might develop such intellectual capacities at a slower pace, are not afforded the time to do so — the opportunity to reason slowly, make mistakes without being crushed, and to retrace their steps and revise their thinking. Under pressure of the volume and pace of material with which they are deluged, many students seek refuge in blind memorization and completely lose sight of the intellectual processes through which they could bring order into the chaos that seems to surround them.

In order to cultivate the development of the reasoning capacities we have listed, it is necessary to give students time, explicit help and encouragement, and repeated practice in all subject matter areas. It is also necessary to enhance their self-consciousness by leading them to stand back and examine in their own words the reasoning processes in which they have engaged. When this is conscientiously done, even if it be at the expense of “coverage” of subject matter, it is readily observed that students develop an entirely new intellectual stance, characterized by heightened respect for their own intellects and by pride of achievement. In consequence they begin to be conscious of the speciousness of the re-

wards they received in circumstances in which they were driven to memorize without understanding, and they are motivated to attack still more demanding areas of inquiry without giving up readily on encountering difficulties or temporary frustration. In other words, to quote Justice Learned Hand's ironical phrases, they become "willing to engage in the intolerable labor of thought — that most distasteful of all our activities."

Justice Hand used this line in a discussion of the circumstances under which liberties might be preserved in a democratic society. His basic thesis was the absolute necessity of a thinking, reasoning citizenry. What capacities characterize such a citizenry? The sophisticated distinction between enlightened self-interest as opposed to short range self-interest must be based on hypothetico-deductive reasoning. Such reasoning is also inevitably involved in visualizing possible outcomes of different policies and decisions in economic and political contexts concerning which one must exercise a vote. There is repeated necessity of discriminating between facts and inferences in the contentions with which one is surrounded. There is the necessity of making tentative judgments or decisions, and it is better that this be done in full awareness of gaps in existing available data, knowledge, or information. There is the highly desirable capacity to ask critical, probing, fruitful questions concerning situations in which one has no initial expertise. There is the need of being explicitly conscious of the momentary boundaries of one's own knowledge and understanding of a particular problem. Every one of these capacities appears in our list and can be cultivated and enhanced, at least to some degree, in properly designed programs embracing a wide variety of subject matter at secondary school and college levels. Thus it might be hoped that an educational framework, consciously designed to enhance reasoning capacities through interlocking experiences in all subject matter areas, and coupling these with affective development and maturation of value judgments, will be more efficient in developing liberally educated citizens and skilled professionals than most such frameworks of the present or the past.

Theme and Motif

A Dialogue

CHRISTOPHER D. KIRKLAND

The following dialogue between Dr. Arnold B. Arons, Professor of Physics at the University of Washington, and Christopher D. Kirkland, of the Phillips Academy English Department, is adapted from the transcripts of the Andover Symposium on Learning in Adolescence. These remarks, from the final session of a team discussion about cognitive development, posit Dr. Arons' reasoning modes against some approaches of one English teacher.

Kirkland: On the last paper I marked before abandoning myself to the Symposium I took apart a girl's paragraph, writing "avoid conjecture, avoid speculation" in the margins and in my comment: "Don't tell me what could have happened, or what might have happened, because that distracts you from what did happen, from what the artist is trying to make happen." Students persistently get involved in the plot and with the characters of a poem, a short story, of a novel, as if they were real, particularly in a novel; it's almost impossible to teach *Wuthering Heights*. My solution to this problem, when it gets that severe, is to say: "In every paragraph you must use the name of the author. You must not write that the hero does such and such, but that the author makes the hero do such and such."

Arons: I'm fascinated by this because you're citing a problem which comes right into these elements of reasoning. They are not

discriminating between their own conjectures and what is in the document under examination. And that kind of discrimination, that kind of awareness of one's own reasoning, is one of the things I'm after in a different context. You have to press them to make that discrimination, and for a time, forbidding conjecture is an entirely legitimate, and probably necessary, way of doing it; and you separate those things.

Kirkland: You're not saying, "I'm against conjecture and I'm against speculation" at all.

Arons: I understand. I'm trying to point out the details of what you said. You're using a mechanism for making them discriminate between those levels of discourse about the novel, and these are elements of logical reasoning of the kind that I'm talking about also. I'm going to remember this one, as I need illustrations of that kind, and I think that's a beautiful example.

Kirkland: Another technique, or device, is to forbid the use of the verb "to be." Their first effort is to substitute "exists," or "seems," or any static verb for the verb "to be." And I say: "That really doesn't work." The next thing that happens is a little bit better; we get rid of the passive voice, because you need the verb "to be" to form the passive voice in almost all cases. And then they have to identify who did what. Now we're getting some returns. You can't say, "It was perceived by," you have to say "Blank perceived." "Who perceived?" "Oh, someone perceived." "Who was it who perceived?" And they begin to get an insight to what happens in literature. Then, finally, you get them to work in transposition as they edit their writing, which is the great glory and crowning achievement. If you can get them up to that level, after shoving them out onto all this thin ice, then you're in good shape. They take their sentence, they cross out forms of the verb "to be," they cross out everything that's interfering, all the static in the sentence — the qualifiers, the "very," the "pretty," the "quites" — and they're left with a couple of nouns and some indiscriminate action. They specify the noun, they make the action more vigorous. They take out loose elements spread over three or

four lousy sentences. They grade every single word, on a scale from 1 to 6, to find out how much, how well each word is doing in that sentence. I tell them that each word, like an ant, must carry many times its own weight. I say "O.K., just use the honors words. Rearrange them." That's the hardest thing to get them to do. "Flop it over, reorganize the good stuff." First, get them to see the good stuff by arbitrarily making them recognize the fluff. You tell them what fluff is; you tell them that fluff is the verb "to be," and its qualifiers and so on. And eventually they can write endlessly without any forms of the verb "to be," and you say, "Fine, now you're free and you can use the verb 'to be' as much as you want. Anytime you're using it, just be able to explain to yourself why. There are good uses of the passive voice: you don't want to shift your subject, you don't want to reveal your source or change your focus, you want to make a parenthetical digression. Use the passive voice."

Arons: That's very nice, but apart from the element of intensive awareness of what one's doing, I don't see a reasoning element of the kind that I've been trying to specify in my list. This is a dealing with language which makes it somewhat different. Magnificent exercise, I love what you describe.

Kirkland: Next, I insist that unless writing makes you think, it's less than half as valuable as it should be. If writing is only a way to express what's on your mind, if it's only a beaker into which you can pour your thoughts, then it's very modest; it's not worth the effort. Writing should be ten times that, or it's no more than a gift that some people have and most people don't. If you can't learn about something, and get insight into something that you think you know nothing about, by writing about it, it's because you don't know how to write. I often encourage students to write about something that's important to them but which they know they don't understand: "O.K., put what you don't understand in the active voice. You know the verb, you know the action that's taking place. Let's identify the villain. What's making you do such and such, what's making this happen, what's motivating that?

"That's called your subject." Writing ought to be a means of clarifying your own daily thoughts and impressions, and a means or tool of insight. A way to understand a poem is to write about it. If you write well, you will understand the poem, the system of good writing will make you understand that poem, and if it doesn't, then you really can't write, and you're wasting a resource. I work from a big premise: "Kids, you know so much more than you think you know. Don't sit there with blank faces. I know you know more about it, and how are we going to get at all those answers you know? Well, we're going to start writing."

A boy was supposed to write a documented report on a controversial issue, and for his first conference he was supposed to bring in all his notes on 3" x 5" cards, with bibliographic reference across the top, everything indexed. And he came in, off and running; he had all these *Time* magazines about troops in Korea. Then, one week later, he comes in and he's supposed to have his outline and part of his first draft done. But he comes in and says: "I can't do it, it's not a controversial issue. Everything I've discovered says there's absolutely no reason for having troops in Korea. I've got to change my topic." I said: "Nonsense." I get up to the board to outline, or to sketch his topic. I hate the linear outline and how it proceeds, so I sketch: "I, II, III, IV, V." "I" is the introduction, "V" the conclusion, "II," "III," and "IV," the body, which we're going to divide into three parts. "O.K., what are all the reasons for keeping the troops in, or for pulling the troops out of Korea?" We need three. One: Economic. Two: Diplomatic. And I don't remember three, two will do. The moral? O.K., there you see a good example. Using this process forced me to understand something about troops in Korea that at the moment I wasn't acknowledging. O.K., back to economic reasons for withdrawing troops: the cost of jeeps. Invert that to an economic reason for keeping troops in Korea. "Well, who makes the jeeps?" "Ford Motor Company." "So keeping the troops in Korea is employing not only soldiers, it's employing people in Detroit, isn't it? O.K., now just go through all those reasons for withdrawing troops, invert them, and figure out the subjects for the verbs. Go on your way, and come

back with the paper." He comes in the day the paper is due, and he says: "I can't write the paper. I haven't got a controversial topic. There are absolutely no reasons to withdraw the troops from Korea." And I had agreed with this kid to begin with, I wanted the troops out of Korea. I had converted his thinking, but he had no sense of — what? Of theme, of something versus something. But the story is to demonstrate a device in teaching writing.

Arons: Yes, but in doing that writing, he had to do reasoning that he was not quite ready for. You illustrated that he was not yet at the point of being able to ask himself those abstract questions to identify the possible factors and the role these factors play. That has to come from the mind, and from the reasoning category.

Kirkland: What was frustrating, in this case, is that I couldn't make this kid switch back and forth. He should have known, from my work with his sentences, that you invert, you transpose, and you look for an answer which the transposition suggests. But he didn't. I had to tell him that, and then, once I told him that. . . .

Arons: I recognize in that student students that I have that are not ready for that, and I fail in the same way you failed. It's not something to be ashamed of. You have an elegant "how" to get at some of these things. I love what I hear, but it's not always going to work for you because some students are not ready to proceed on that basis. I come a cropper all the time on this.

Kirkland: But this boy was in a class of promoted kids. Already identified for his excellence by getting into this school, he arrives and, in two weeks, he distinguishes himself among excellent students to be promoted and advanced. Then you run into this problem. What I'm getting at is that this very block, this tunnel vision, these blinders this guy had on, were part of the reason he's as good as he is. I really debated about whether to call him well focused and intelligent, or stupid and blind. His clarity of vision was his problem.

Arons: I'm talking out of the dark, but I'd almost make a bet that some of that other good performance that he's been rewarded for is specious, that he has a facility for producing the answer the

teacher wants without understanding what is behind it. There's a lot of that kind of thing going on, and I'd almost make a bet that that is involved here.

Kirkland: I was relieved that I was not continuing to teach that student's section, and I consoled myself with the thought that he was having success elsewhere, and getting good support, I suspected, in physics or mathematics. But he would have had a bumpy road with me, because I spend a lot of time teaching theme, as opposed to motif. When you identify something in a story, and you cannot identify its opposite quickly, if something opposite doesn't jump out at you, then it's a motif. You find optimism. O.K., you look for pessimism. If there's another character who's pessimistic, then you have a theme. If there are no pessimistic characters, then a motif of the story is optimism. A motif is a refrain, something that's said again and again and again, and its opposite isn't said. If its opposite is expressed, then it becomes something thematic, something dynamic, a point of tension in the story. Pick a poem or a short story that we all know, or that some of us know, or that at least I know, something familiar to you.

Arons: Swinger of Birches.

Kirkland: O.K., Swinger of Birches. Well, first you get the chronology right. What happens in Swinger of Birches? Somebody's walking. And once you begin even to paraphrase or to summarize, you're making choices and you begin to understand the poem; probably the most fundamental thing is to summarize the action of that kind of a poem. A "poet" is looking at birch trees bent into the snow, and he's saying "what makes these birch trees bend into the snow?" That's not where he says "elves," is it? He says, "I can figure that out scientifically. I can explain to you what makes those birches bend, but I don't want to think about that. I would rather think that these birch trees are bent down to the ground because a boy had swung on them. And I remember that in my boyhood I used to climb to the top of birch trees, and that I would climb and climb and climb, more and more carefully so that I wouldn't swing prematurely, and I'd get to the very top, and

then I would throw my feet out, and hold on to that tree, and I would drag that birch tree down to the ground. And that's why these trees are bent down to the ground. I know that's not true, but that's how I want to think of it. I know, scientifically, that it's winter and snow."

O.K., let's look for the theme and motif. Well, there's science, isn't there? "I know how these birch trees are bent to the ground." What's the opposite of science? I'm not going to answer. You said "imagination?" I have an opposite in mind, but I say: "O.K., kids, what is in the same order as science? Something proportionate, something that balances with science. I'll know better what you think about as science when you tell me what you think its opposite is." And they'll say something that's wholly out of scale: "God." "Now, wait a minute, God and Science? Could you have a prize fight between God and Science?" Well, that's a better idea than I thought it was, but it doesn't ring right. Science versus Imagination. O.K., let me take "imagination," and now what's the opposite of "imagination," you can't use "science?" "Lack of imagination?" Maybe we need another word for "imagination." You say "short-sightedness?" O.K., short-sightedness versus long-sightedness. Now we really have something in proportion, and these two things have suggested each other. O.K., what's short-sighted, in the poet's mind? Thinking that, knowing that, stopping your thought at the knowledge, being satisfied with the knowledge that these trees. . . .

Arons: That the load of snow. . . .

Kirkland: Yes, that's being short-sighted. And what's long-sightedness? It's a recognizing of reality for what it is, but being able to be "imaginative," to get back to the vocabulary you suggested. So, I've got to write a paper about this. Well, Part I is my intro, Part V is my conclusion. Parts II, III, IV. It's a poem about shortsightedness, Part II, versus longsightedness, Part III, and Part IV will work towards a conclusion of something about the poetic imagination. And my introduction is going to be something about the observation of reality, and I'm going to write a second paragraph about

all the short-sighted realities that this poem observes, showing how he transfers them into long-sighted imaginations, and to his assertion in this poem that for him "the road less travelled by," throwing in a little other Frost. . . .

Arons: Let's mix it up a little bit.

Kirkland: Yes. But earlier I was talking about an analytic kit of tools — a pair of pliers, a screwdriver, and a hammer — to take a poem apart. How do you go about providing that? Well, you use your writing. You don't let yourself be passive, you avoid being static. You use sentence structure. And you also try to label some things in that poem. Once you've got something labeled, you try to find its opposite in the poem. If you can't find its opposite, if it's recurrent, then it's a motif that characterizes the poem. If you can find its opposite, you've identified something thematic, and you can begin to block it out into a sketch and you're on your way. I feel that unless my students have confidence in that kind of gear, unless they can depend on something mechanical, that I'm teaching literature as a pipe-dream for the gifted, that some of us are imaginative and enjoy literature, and some of us don't. And that maybe exposure and practice will work if you sit there long enough, and if your teacher's pretty, if it's a nice, warm day out, maybe poetry will catch on, maybe it won't. And I just think all that is a lie.

Arons: In the enterprise you described with the poem you defined a powerful pair of concepts, and you defined them clearly and unambiguously.

Kirkland: In terms of each other.

Arons: That's right, and you gave a description of how they were to be recognized. And then you used those concepts to analyze what you had in front of you. But there's that wonderful nostalgia of the last lines.

Kirkland: "So was I once a swinger of birches, So. . . ."

Arons: "So was I once a swinger of birches." And that always makes something tremble in here when I hear that.

Kirkland: We work at that later. I try to say that if you don't have anything to say about a movie, a play, a poem, tell me if you like it or not. "I don't like it!" "Why don't you like it? Where don't you like it? What bugs you about it?" Or "Why do you like it? Where do you feel warmth? Why do you feel warmth about that? What word? Identify the word for it." "Love." "What's the opposite of love?" "Hate." "Is there hate in the poem?" "No." "Is that why you like it?" And so forth. But it's entirely analytic. I spend a long time trying to differentiate between analysis and interpretation. I say: "When I am asking you to analyze a poem, you may interpret if you want to, but not until you've analyzed it."

Arons: Discrimination between observation and inference.

Kirkland: I insist that first they take the poem apart and look at its pieces because everyone can do that. Only a very few people can jump right into the middle and interpret, but I know I can make every student analytic. The ones who can be interpretive naturally have an extra resource. And the ones who can't have a resource.

Arons: And the analysis part is the one that comes close to what I'm trying to talk about.

Kirkland: But if I just walk in and say "analyze this poem," they'd try to interpret it. They do not understand analysis as the opposite of synthesis.

Arons: That's right, you have to define your concepts first.

Kirkland: You have to do more than that. Again and again and again, you have to practice it. . . .

Arons: . . . to practice it, and illustrate the procedure, carry them through it over and over again. You're talking exactly the same language I've been. Analysis is one element. You want to be careful not to say that's the end and all. But you obviously consider that an important part of what you're trying to do, and that's the part that relates closely to what we've been talking about.

Kirkland: It's the one I can depend on in a group situation. I know it's going to be valuable enough to every person in that group for me to pursue. I don't have to apologize, and I don't have to say "O.K., you three, I'll take care of you later." I can say: "We're going to work with everybody, everybody's going to learn this, and we'll work more individually once we all understand this."

Arons: I would say that in giving them the practice, in establishing the ground rules and practicing analysis, using the idea of theme and motif, that as they make progress in that utilization and are analysing the poem or story more skillfully, they are in the process of cognitive development.

Kirkland: A more difficult problem is to deal with the issue of persona. "O.K. kids, is this the poet? When do you say 'Frost', when do you say 'the guy who is walking through the woods?' Is the guy walking through the woods also the kid who was swinging from birches? Is he imagining that? Isn't that an idealization? Didn't he really do that? How do you know? Is it worth speculating about?"

Arons: How do you know?

Kirkland: Is it conjectural?

Arons: How do you know?

Kirkland: You do know. What makes you think one way or the other, tell me. You say "Yes, it's Frost." "How do you know? Do you know much about Frost?" "Well, no, but . . ." "Well, you may be right. How? Let's assume you are right. I know a lot more about Frost than you do, and I'll tell you you're right. You're a whole lot right. How did you know that? Was it diction, the poet's choice of words? How did he convince you? Why does he have authority, what makes him seem authentic to you? You know that Robert Frost is a fraud, don't you?" By then you're into a wonderful realm where you get personalities involved, and it gets very aesthetic and affective, and you know how to talk about literature. That's difficult. Persona, mask—I could teach that up through graduate school. I can contribute to the best minds by

talking about persona and mask. It's something that interests me, and I know that a person, whether he knows or not, has ideas about persona, that I can get to him by talking about persona. So for me, that's very effective, and that's how I would move from analysis into things aesthetic, to get at the problem of the nostalgia, and to what extent we idealize at nostalgia as an idealization of history, of our past. And on to nice, waffly things like that, the stuff we're always accused of doing. But there's something very unsatisfying about this sort of a pirouette. I feel ambivalent in talking about such devices and techniques with my colleagues in the English Department, because I don't ever want to say "this is how to do it." I'm sure that whatever way, as long as they found their own way to it, with honesty and sensitivity and purpose and dedication — that if they've really thought about it and if they're not just parroting how they were told to do it — that it will work for them, whatever it is. But when you talk about, for example, "control of variables," I feel that you're equipping a student with a volt-meter to do an electrical problem, with a very sophisticated apparatus, instead of a pair of wire clippers or a pair of pliers.

Arons: No, you're overdoing it. There are very rudimentary situations in which you must be conscious about the roles of variables, and whether they're being controlled or not. And perhaps, even in your discussion of literature, you don't get involved in that particular kind of reasoning at all; but there are other elements in there.

Kirkland: But your list, your kit of tools, is really pretty fancy.

Arons: Yes it is. Nevertheless, a major chunk of those kinds of reasoning appear immediately if you examine what sort of judgments we have to make from day to day as citizens.

Kirkland: When I think of your list of tools, I imagine the teacher as the father who can put a chemistry set under the Christmas tree. That's great, we can do that for most of the kids here, for most of them that's been done. And yet, even they still need this pair of pliers, this screwdriver, this hammer. They're rudimentary, they're all-purpose, and you've got to throw them away and get better

tools when you talk about persona. You can't talk about persona even with a pair of channel-lock pliers. You need a wrench, and the wrench has got to be metric. You can't mess around.

Arons: You have to, I'll coin a phrase, inch along towards metrification.

Kirkland: Well, I don't mean to sound ungrateful, and I'm immensely flattered. But this is a pirouette, it's an opportunity to prate, and it almost seems like cheating, because it doesn't work as well in the classroom as it does with you.

Arons: Oh, I heard that in you before, and I tried to tell you that was wrong.

Kirkland: In speaking about teaching propositional logic you said that you didn't want to see it taught as an *ex cathedra* course isolated from other things, that you wanted to see the "need for it emerge out of more ordinary experience." That phrase is a very significant part of what we're talking about, isn't it; that's almost our logo.

Arons: In a sense, yes. And it underlies, in particular, the new elementary science curricula that began to be published about 1968. The whole science structure that it's providing, in the best of these curricula, is centered right on it.

Kirkland: It's certainly what I'm talking about. It's giving them a little bit of experience in the form of a poem or short story, and pointing out to them that they have the capacity, coming in from the streets, to apply whatever they use in the streets to this poem, and to extend the two to set up a dynamic between the two, between what I'd call art and life through education.

Arons: I'm entranced with what you say, and I wish I could have had your course, and I was agreeing.

Kirkland: It's all in *The Elements of Style*; E. B. White spread thin.

THIS MUCH I CAN SAY FOR CERTAIN

The expulsion of the Hyksos from the Delta,
Horses and all,
Occasioned without question
An over reliance on the priesthood
Whose god, Amon, was presumed
To have carried the day
And on the army
Who in fact carried the day
And on the scribes
Who knew where everything was,
How much, and whose.

Pharaoh still cut a fine figure
Into cliff and wall,
But the Hebrews were restive
And humdrum was here to stay;
Tomb vandalism every day
And the doubts, the doubts.

Then Akhenaton walked out into the sun
And said, "See here. See here.

Aton is God.
He talks to me in blazing sun.
I will tell you everything
In Egyptian."

And lo, in just ten short years,
His plans came to nothing.

RICHARD A. HAWLEY

THEIR TOWN

At the meeting everyone waits
for the stranger to speak
of cool arms, thighs, silk

flesh in motion. He sips
a bourbon and water, dries
his lips with a tiny paper

napkin, and says, "The average
American moves twelve times
in a lifetime." Disappointing.

They have always lived in this
damp climate, in this town,
everything's gray with mold,

shoes, power tools, children.
People are used to it. They
are quick to fill the holes

between words, when they feel
their veins turn gray. Only a
stranger might wonder how they

can cut corn and sweet clover
or watch a football float over
a goalpost and never mention

the difficult breathing, dreams
they have in daylight, how
every weekday in season the air

is clouded with falling birds.

PHYLLIS JANOWITZ

On the Hidden Treasure of Paid Attention

The Need to Know

ROBERT GRAHAM KEGAN

These days my daughter is learning to read. (You understand, of course, that when *you* talk about your children you're being a doting parent, but that when I talk about mine, I'm reporting on my longitudinal investigations. These are the privileges of being a developmental psychologist.) I watch her listening intently to her own announcement of each letter's sound. "SIH-AEH-NIH-DUH," she says, peering over these symbols, sitting still among these sounds which do not yet cohere for her. "SAAN-DUH." It is still an alien sound the way she says it, something strange and apart from her. She waits, strenuously. "SAND!" she says, arriving home.

It is not her experience I want to attend to here, but mine. The truth is I find myself terribly moved by this tiny dignity. When her forehead furls and I see her there so intent, something sympathetic flexes in my heart. She grasps a word, but somehow she grasps me as well. I could even say that I love her a little harder because of this moment. I admit some small part of me feels a bit guilty in saying so. That part chides me: "What? She has to *do things* in order for you to love her? What happened to 'unconditional regard'? And what sorts of things — the little favorites of a middle-class intellectual? And is it her effort that appeals to you or her success?"

But actually most of me does not feel guilty at all. And I think

this is because however much self-congratulation might be involved, however much I might appreciate or identify with her being "successful" or "smart," and however much any signs of these might cheer me, this just does not seem to be finally what my experience of being moved is about. There is something simpler and deeper, something else. And I have felt it before, with people who aren't in any way "mine." Somehow being in another person's presence while she so nakedly and honestly and investedly labors in an activity that is astonishingly intimate — the activity of making sense — is very touching. I don't know why this touches me so. But I do know that I am not the only one who has felt it. In fact, I believe that most people have felt it at one time or another, and that all people are capable of feeling it. In a sense this experience is all that this article is about.

There is something else I know about this feeling. You and I experience it more with little people than big people. In fact, while it is commonly reported among people who spend time with children, it is uncommonly reported among people who spend time with adolescents. I do not think adolescents less frequently display themselves in these touching and elemental ways, but we are less able to see those ways for what they are. We are depriving ourselves of a wonderful experience.

But why should we care whether people who spend their lives with younger people have this kind of experience? It may be nice for them, but does it matter much for the people to whom they are responsible? The answer is that a person's life depends on whether she moves someone in this way.

I mean this even literally in the first few years of life, and every other way in all the years that follow: Our survival and development depend upon our capacity to recruit the invested attention of others to us. How does that happen? Let's start at the beginning. Nature is nowhere more graceful than in the way she endows each newborn infant with seductive abilities. I do not know why but the top-heavy appearance of the infant's body (the disproportionately large head in relation to the torso, and, concerning the head itself, the disproportionately large forehead and cranium in relation to

the lower face and jaw) attracts people to it. There is a world of mystery and hundreds of thousands of years of genetic wisdom behind our experience that a baby is "cute." A baby's cute body serves to draw people to it, but someone, usually its mother, must not only be drawn but *stay*. There is no sadder or more thought-provoking material in the research on infancy than the documentation that babies fail to thrive and even die without an attachment to a consistently present caretaking person even if the babies are fully protected from hunger, cold and disease. Among the ways an infant draws another to her none is more powerful than her eyes. It is arguable that Nature had the assurance of these species-promoting relationships in mind when she linked the determinants of visual attention to discrepancy. Nowhere does the body have more contours and contrasting shapes than on the face, and nowhere is the contrast greater than the area of the eyes. A mother can be forgiven her sense that her infant is looking at the windows of her soul when the infant so quickly fixes on the dark spots that are the mother's eyes. It is hard to believe that the appeal this has for the mother, who gets hooked into looking back, is a lucky accident of Nature. A person might be a match for an infant all by itself, but in these moments the baby has on her side the most powerful ally of all. Less than eight months after she is born, the infant will make an honest woman of her primary caretaker: for now she really recognizes the mother's face as distinct from others, and, in a way that must again draw the mother closer, will find other faces distressingly strange.

This capacity to hold the mother with a recognizing eye is as fundamental to our development as the prehensile capacity to hold a physical object. It has been suggested that the human being owes his capacity for higher consciousness to his thumb of all things, that peculiar digit which can swivel itself 180 degrees and so permit the hand to hold something. The ability to grasp permits the ability to use tools or extend the natural functions of the body. This permits the ability to move outside one's body reflectively and so begins self-consciousness. What is experienced physically and concretely is later experienced metaphysically and abstractly. What is today

the prehensile grasp is tomorrow the grasp of apprehension.

But I believe there are a number of similarly primordial experiences that begin in the infant's *social* world. What distinguishes these from the grasp of *things* is that they are *intrinsically* social, i.e., the "object" which is grasped is also a self, itself a grasper. None is more powerful perhaps than the glance, the interplay of eyes, the looking at someone who is looking at you. The experience of being seen and not being seen, universally acted out in the game of peek-a-boo (in Japan the grownup says, "Nai, nai — bah!" something like, "Nothing, nothing — Here I am!") is as subject to future abstracting as the prehensile grasp. The need to be seen, to be recognized, however it changes in the complexity of its form, may never change in its intensity.

The consequence of this beguiling, the infant's relationship with her primary caretaker, like that of her relationship with physical objects, is her further development, a new kind of consciousness, a qualitative growth in her making of meaning. The infant, who before regarded the world and everyone and everything in it as a part of herself becomes able to differentiate herself from others. Instead of being fused with the primary caretaker, she is now able to *relate to* her. In creating for the first time an "object world" or "other world" which *the infant, too*, sees as "other," the infant begins the history of successively joining the world rather than incorporating it, of holding the world while guaranteeing its distinct integrity, which is the history of human development.

Thus just as the object-grasping infant is doing something which, in another form, she will try to do all her life ("grasp things"), so the seductive, attention-recruiting infant is doing something she will try to do all her life (recognize and be recognized) — and at bottom it is the same thing: it is the activity of *knowing*. *Knowing*, we see, is, in its origins, a *physical* activity (grasping, seeing), a *social* activity (it requires another), a *survival* activity (in doing it we live). *Knowing*, understood in this way, is the primary human motion, irreducible. It cannot be divorced from the body, from social experience, or from the very survival of the organism. Knowing depends on someone who recognizes you. Not knowing,

by definition, is utterly lonely. Well-fed, warm, and free of disease, you may still perish if you cannot know.

The reasons why we are drawn to others, especially to their welfare, are surely mysterious. But so many of the eliciting situations seem to harken back to the exigencies of this basic life motion, the activity of knowing and the threat of not knowing. We are drawn to a person in heroic struggle; we are drawn to a person vulnerably alone; we are drawn to a person who seems intensely alive; we are drawn to a person whose efforts make a kind of "perfect sense" to us. I admit to wondering if our attraction is not of some force "bigger than both of us," a kind of "species sympathy" which we do not share so much as it shares us.

This sympathy is in great supply for newborns — and newborns share a powerful capacity to elicit it. But Nature, having done her part when it is most needed, is not so democratic after infancy. The capacity to recruit another's invested regard, so uniform at birth, becomes a wildly various affair as people grow bigger. Some people have a much greater ability to recruit people's attention to them than do other people. This obvious fact, so underinvestigated by psychologists and so commonly denied by teachers, is never forgotten by teenagers. Teenagers could have told researchers *before* they spent huge sums of money discovering it that the greatest inequalities in education are not *between* schools (of different economic strata, e.g.) as *within* them, and that greater than the inequalities of social class or achievement-test scores is the unequal capacity of students to interest others in them, a phenomenon not reducible to social class or intelligence, which seems to be the more powerful determinant of future thriving. That some people are more attractive than others teenagers know most poignantly because they have just come to discover it in a way they can name. As Janis Ian sings

I learned the truth at seventeen
That love was meant for beauty queens
and high school girls with clear-skinned smiles
who married young, and then retired
The valentines I never knew

The Friday night charades of youth
were spent on one more beautiful
At seventeen I learned the truth

And those of us with ravaged faces
lacking in the social graces
desperately remained at home
inventing lovers on the 'phone
who called to say 'Come dance with me'
and murmured vague obscenities
It isn't all it seems at seventeen

A brown-eyed girl in hand-me-downs
whose name I never could pronounce
said 'Pity please the ones who serve
They only get what they deserve'
The rich-related hometown queen
marries into what she needs
A guarantee of company
and haven for the elderly

Remember those who win the game
lose the love they thought they gained
in debentures of quality
and dubious integrity
Their small-town eyes will gape at you
in dull surprise when payment due
exceeds accounts received at seventeen

To those of us who knew the pain
of valentines that never came
and those whose names were never called
when choosing sides for basketball
It was long ago, and far away
The world was younger than today
and dreams were all they gave for free
to ugly duckling girls like me

We play the game, and when we dare
to cheat ourselves at solitaire
Inventing lovers on the 'phone
Repenting other lives unknown
that call and say 'Come dance with me'
and murmur vague obscenities
at ugly girls like me, at seventeen*

* by Janis Ian, © 1975 CBS, Inc.

Some adolescents are more attractive than others, and if we don't want to talk about it, we might at least acknowledge that it has something to do with the sense many adolescents have that school and life itself is "not fair," a matter of "luck," and "who you know." But why don't we want to talk about it? The usual response is that there is nothing to be done about it, so it is better to pretend it isn't there. (This is remarkably like the usual attitude of teachers toward their own *sexual* feelings in the highly charged environment of a high school.) These kinds of attitudes contribute to the crazy-making sense in many high school classrooms that one kind of conversation and exchange is going on uptop (the polite ping pong) while down below, if you turn an ear to it, there is the thunderous roll of bowling balls. But of whom are we speaking when we say someone is less attractive? "Attractiveness" is a word that speaks to a field of interaction. If a teacher doesn't find a student attractive, is student unable to recruit or is the teacher unable to be recruited? I have asked teachers (and have done it myself while I was teaching high school) to attend for a while to whom they find themselves giving their attention and how. We usually discover we spend the most time with the same group of students with whom our colleagues spend the most time, and these very students are usually the most sought out by other students. If this is true, is the teacher, in this respect, any different from any unselfconscious person who is thrown in with a group of other people?

But I wonder if teachers should not be different, especially if they are there not simply to *follow* in the directions they first feel pulled but to do a kind of *leading out* as the very word "educator" suggests. If I am at all right that *knowing* is about a relation to the world of objects and others, that knowing is a social activity requiring recognition of others, that the very fate of a person's knowing hangs on whether she can recruit others to do this recognizing, then the issue of *the teacher's capacity to be recruited* is as crucial to the teacher's success as a facilitator of knowing as the capacity of the student to recruit others is crucial to her robust development.

Can a teacher widen his or her capacity to be recruited? I think we have probably all had the kind of experience — often one of

adversity — which later allows us to understand someone we couldn't understand before. And it is our understanding of the other that makes us vulnerable to recruitment, to being moved, our recognition that the other's experience is meaningful.

In part it is my recognition of how meaningful — how full of the activity of meaning — is my daughter's effort to read the word "sand" that moves me. Perhaps the same kind of understanding of bigger people depends on some sense that the adolescent is engaged in activities which, at their own level of sophistication, are identical to the more immediately moving primordial activities of little people. Consider a couple of these; they happen at the same time, the beginning of the second year of life, and are actually related: learning to walk, the experience of dynamic balance or buoyancy, and the experience of catastrophic imbalance or collapse; and grasping a thing, retrieving a ball that has rolled out of sight, the experience of losing and finding something. These are activities of knowing, of subject-to-object relations, at a critical period in its history. For the nature of those relations *are* changing. Both activities newly practiced reflect the gradually developing differentiation in knowing which accounts for every characterization of this period. (At the heart of Freud's notion of a move from "orality" to "anal-ity," or Erikson's "trust" to "autonomy" and "mistrust" to "shame" is this same differentiation.) These are activities of knowing, and knowing in transition, a time of separation. But this activity is not restricted to infants. It is actually panorganic, and it is certainly lifelong. There *is* life after childhood.

An adolescent is engaged in a balancing act as fragile and touching as a one-year-old learning to walk. She is learning to balance the instinctive, impulsive, demanding side of herself with the internalized controls of civilization; she is learning to balance her emerging sense of herself with the sense of herself she is beginning to discern from others; she is learning to balance her vision of a future role and set of activities for herself with the tasks, opportunities and expectations society sets for her; as an early adolescent, she is learning to balance her loyalty to her own needs, interests and desires with her emerging loyalty to the preservation of inter-

personal relationships and the kinds of compromises and mediations they require; in later adolescence she is learning to balance her loyalty to interpersonalism with her emerging loyalty to the maintenance of a group or social order and its code of which she begins to feel a part.

An adolescent is engaged in an activity of finding and losing the object that, in its own terms, is identical to the year-and-a-half-old child who is gradually able to retrieve a ball after it goes under a blanket. The infant's vacillation and tenuousness is evidence of its only-emerging ability to differentiate itself from the ball and recognize that although it is out of sight, it still exists. The adolescent, too, is engaged in a process of redefining her object-world which, too, is a matter of losing and finding. She differentiates herself from her family and gradually, tentatively, finds new others, especially peers. She loses the sense of the concrete world, the "actual," and "the physical" as the ultimate and totality of experience, and gradually, tenuously, she finds the abstract world, "the possible," and the "metaphysical." In early adolescence she loses others as satisfiers and fulfillers of her own needs (marketplace cooperators) and slowly finds them again as partners for mutuality (chums, collaborators). In later adolescence she loses her dependence on (and comfort from) others who will define her and very gradually, tentatively, becomes the guarantor of her own identity.

While I am suggesting that it may be helpful for people who work with adolescents to know some of the particulars of an adolescent's own efforts to walk or retrieve a lost object, it is not so much this kind of *information* that seems to me to make the difference as the *conviction* that would lie behind a person's wanting the information. I do not believe it is as crucial to know immediately what a person's actions mean as it is to explore the possibility that they *are* meaningful expressions of the actor's integrity. This carries us beyond the piety that "we have to take people where they are" into the more radical assumption *that* they are, that they are alive and therefore *knowing*, and in some way which anyone who would seek to engage their knowing might try to understand. A child learning to walk or read can move us, draw us to her,

in part because the behavior is so immediately meaningful to us that the intensity with which it is carried out affects us as an expression of the little person's dignity. The "con man" manipulations of an early adolescent finessing the authority of the teacher usually does not move the teacher much (except to irritation), and its persistence is seen not as an expression of integrity but intransigence.

Since I began with a story of a little girl learning to read, let me conclude with one about a con man, actually a con woman, someone else's daughter. I met Terry, almost sixteen, on a psychiatric ward where her exasperated parents had just brought her. The parents were not beastly or even unsympathetic, but they had come to an end with their daughter, whom they could not control. The final blow had come that week when the mother called the school to discover that her daughter had skipped. When Terry returned home at the appropriate afterschool hour and was confronted with the mother's information, Terry flew into a rage at what she regarded as her mother's intrusiveness and demanded that her mother give her her bankbook so that she could run away. When her mother refused, Terry took twenty dollars from her mother's purse and barricaded herself in her room. When the mother forced entry, Terry escaped through a window and led the mother, assorted allies, and eventually the police on a seven-hour chase which Terry tells us about in the hospital with glee. On the checklist at admission Terry's mother describes Terry as "bright," "egocentric," "narcissistic," and "manipulative." Terry characterizes her mother as "stern," "strong," "stubborn," "nagging," "unwilling to compromise," and "headstrong."

In the hospital, where group therapy and participation in the life of a ward community are the primary media of treatment, Terry is having a terrible time. She can be seen in group meetings struggling unsuccessfully to talk about herself in a way the staff will approve. When she says in many different ways that "my problems are not mental; they have to do with getting along with my family," the staff, however gently and indirectly, is not satisfied with the formulation and takes it as resistance to deal with herself,

her own feelings and responsibilities. The staff can see that when she does speak the language of internal reflexivity, she is doing so by triangulation, or imitation, that she is not really speaking her own voice; this, too, they take as a kind of slipperiness or dishonesty. Their exasperation with her grows, and when it is discovered both that she spoke to people outside the ward about people inside the ward (a cardinal violation of patient-patient bonds) and that she used "unprescribed drugs" during a weekend pass (a violation of patient-staff bonds), the staff throws her out of the community ("precipitously discharged"). They understand her behavior as hostility and acting out, and they justify their own on the ground that she "would not do the work of the ward," "was argumentative," "was disruptive," "was inciting to other patients" and "was a staff-splitter." The staff was pretty mad at Terry.

Now I think it is fair to say that no one — not her parents or an outstanding professional staff — was drawn to Terry at sixteen in a way they might have been moved by her struggle to walk at one or read at five. It would *not* be fair to say that no one loved her. I believe her parents love her very much, and that some people at the hospital stood ready to pay her a kind of attention I would not be uncomfortable calling a species of love. But love comes in *shapes* as well as *intensities*; it has a way of seeing or not seeing, which can never be made up for by the depth or sincerity of caring that accompanies it. It is this seeing, this paid attention, that is the hidden treasure. Terry's parents love her, and the hospital was ready to care for her; but she was unhelped because no one could feel moved by or attracted to her. On the contrary, people found her, totally and figuratively, revolting. People are moved, we have said, by heroic and vulnerable expressions of dignity and integrity, and no one could see these qualities in the way Terry lived her life.

The kind of "research" my colleagues and I do consists in an awkward and laborious process bent on discerning the nature and state of the very meaning-making, or *knowing*, about which I've been talking. Lately some of us have begun these explorations with psychiatric patients, especially to see if what passes as disease or illness in some quarters might not be better understood as the suf-

fering which can be a feature of *knowing* in the process of transforming itself, upheavals akin to *not* being seen, *losing* the object, and being *out* of balance. From our systematic conversations with Terry, a researcher who had no familiarity with her pre-hospital history or her experiences on the ward was able to see that Terry was only beginning the differentiation from her own needs and wishes that would eventually permit her to invest her loyalty in the strictures and benefits of interpersonal relationships. The feeling of losing others as satisfier and guarantor of her own satisfaction was still so staggering that the possibility she might recover others again as partners in an interpersonal world was at the moment beyond her ken. High I.Q. notwithstanding, Terry's developing "biologic," the evolution of her meaning-making, was poised at a precipice more familiar to persons three and four years her junior. In fact, her I.Q. and verbal dexterity only exacerbated her predicament since other people felt justified in counting on Terry to know them and herself in a fashion appropriate to her age.

Seen in this light, I wonder if Terry's behavior, so inciting to those around her, does not begin to take on a different cast. I wonder if her "manipulation" is not, at the same time, the universal effort of all organisms to order and regulate their relations to the environment. It is just that the limits of her regulating are such as to make it impossible for her to hold "the other" interiorly or imaginatively (the shared reality, the essence of mutuality) so that she must seek to hold and regulate the other externally. I wonder if her violations of group rules are acts of defiance and hostility (which presumes she shares a sense of their rightness and defies them) or whether the benefits and purpose of meeting the other's expectation when it interferes with one's own interests are lost on her. I wonder whether her inability to speak reflexively about her "problems" is a resistance, or an accurate reflection of the way she makes sense of herself. And I wonder if in fact she did not speak with poignant precision to the staff on the agony of the very transition she is undergoing when she said, "I don't feel like a whole person anymore; it's like others are woven into me!" I begin to wonder if the exasperation of Terry's parents and the staff does

not spring from their disappointment at not being known (not being held, grasped, seen, found, balanced with) in the way they expect. And I begin to wonder if a form of treatment for Terry which presumes *at the outset* that very capacity (to be a member of an interpersonal community) which is actually her growing edge, is not in the end a form of cruelty.

This is not to suggest that Terry's behavior should go unassailed. It is to suggest that before someone deals with her behavior, someone must see her. It is to suggest that her behavior is the vulnerable and heroic exercise of her integrity. "Integrity" seems the perfect word here, as it has a biological as well as a psychological meaning, and both are intended. It is to suggest that when I feel recognized and have a sense that you understand how I am experiencing my experience (whether this is how you experience it or not), I can find your limit-setting tolerable and even a relief; if I do not feel recognized, I resent it as a violation of who I am. Which is just what it is.

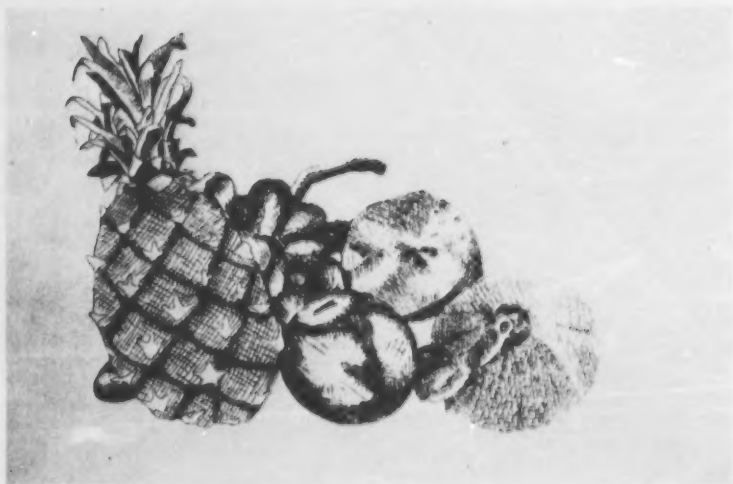
The risk I run in understanding Terry is not that I will lose my sense of the harmful or destructive nature of her behavior or paralyze my efforts to be of help to her in changing it. The risk I run is that in seeing her for who she is — intent there, brow furled, sounding out the letters of a half-perplexing sign — I will be moved by her. Our lives depend on someone running this risk.

DAUGHTER

— from the waiting room

Just now you drift
through me like fog
that vanished from
the inner harbor
yesterday; you are
still here hiding in
clear air curling
my hair, oiling
my skin, and soaking
my lungs as surely
as when first I lay
my face alongside
your mother and felt
the current of your breath.

RANDALL PEPPER



CHARLIE DEAN

A Skeptical Consumers' Guide to Educational Research*

DENIS C. PHILLIPS

There are, no doubt, many grounds on which the work of educational researchers can be criticized, and indeed it is the purpose of the present paper to highlight some of these. But at the same time, it is important to recognize that some criticisms of research are unfair. Thus, educational researchers are sometimes criticized for not tackling the major issues of our times. During 1976-77, to take a prominent example, three hundred of the twenty-seven thousand teachers in the Los Angeles Unified School District were reported as having been assaulted, and presumably there were many unreported cases. The figures showed a 16% increase for the first part of the 1977-78 school year. Over the same period, there was national publicity about the declining S.A.T. scores of prospective college entrants; and the inability of high school students to read and write was touted in *Newsweek* and elsewhere. A cynic might suppose that educational researchers were kept busy accurately documenting these horrors, and unfortunately had little energy left to seek out solutions.

This cynical position is, of course, unfair. Many of the problems that plague the schools are not in the first instance educational problems; they are social problems that have invaded the classroom, and it is unlikely that solutions will be forthcoming by

* Numerous discussions with my graduate teaching assistants, Jennie Nicolayev and Nancy Sanders, have contributed to the development of ideas in this paper.

making adjustments to the school system. Vincent Fontana made a similar point when reporting on the work of the mayoral task force on child abuse in New York City, which he chaired:

Child abuse is a symptom of the violence running rampant in our society today. It is inextricably linked with unbearable stress, impossible living conditions, material or spiritual poverty, distorted value, disrespect for human life, drug addiction, alcoholism, assaults, armed robberies, murders and other ills in the midst of which we live — and for which we must find massive healing.¹

The same point, too, is often made by neo-Marxist writers on education, who see the school system as merely one facet of society which is relatively powerless to institute radical reforms. As society goes, so go the schools — and not vice-versa.²

So the point must be granted that it is unreasonable to expect educational researchers — armed with expertise in statistics, psychological testing, experimental design, interviewing techniques, and the like — to solve many of the problems that face the nation's schools. It is more reasonable to inquire what issues researchers *can* pursue, and then to see if, in fact, reliable and pertinent findings have been uncovered.

It would not be seemly for the present author, who is affiliated with an institution whose *raison d'être* is the training of educational researchers, to attempt to encapsulate the world of current research in a few pages, and no attempt will be made to summarize the lines contemporary work is taking. But it is possible to offer some cautionary remarks about how research findings ought to be interpreted by consumers, whether these results come from psychologists on such things as learning theory or the stages of cognitive or moral development, or from sociologists investigating structural effects within schools or social class influences on scholastic attainment. In other words, while it is illegitimate to criticize researchers for not doing what they cannot do, it would seem to

¹ Vincent Fontana, reported in the *S. F. Sunday Examiner and Chronicle*, "This World," May 28, 1978, p. 2.

² See, for example, M. Carnoy and H. Levin, *The Limits of Educational Reform* (N.Y., David McKay, 1976).

be eminently fair to closely scrutinize what they do attempt to do in order to see if it can withstand the skeptical eye.

In accordance with this fair principle, then, the following discussion will focus on several issues about which skepticism seems particularly warranted: research with universal pretensions; the limits of statistical methods; trivially true research; the problem of the suppressed premise; and the is/ought dichotomy. Throughout, a small number of running illustrative examples will be used — examples that are no doubt familiar to the reader through their rising educational influence; these examples do not exhaust the realm of educational research, but it is hoped that they will serve a useful purpose. Obviously, too, the discussion is not encyclopedic, and many limitations of research which ought to be discussed have not been focused upon.

Research with universal pretensions

Some research, but of course not all, is aimed at establishing universal conclusions. Among notable examples of this genre are the work of the Piagetians on the stages of conceptual development that are passed through by all children and the related research of the Kohlbergians on the stages of development of moral reasoning. Both theories — or rather, both sets of theories, or research programs³ — aim at explaining development of *all* children, not just Swiss or American youngsters. And both programs are becoming increasingly influential in schools; much curriculum development nowadays tries to take account of Piagetian findings, and there are programs in the field of moral education based on the work of Kohlberg and his associates.

The point about any such research program that stimulates a skeptical response is a simple one: a universal conclusion of the form that "all X are Y" is very strong, and it is not clear what sort of evidence could *ever* fully warrant it. It has long been realized by philosophers of science that even if all cases of X up to the

³ The theories of Piaget, Kohlberg, and their co-workers have not remained static over time. The terminology "research program" indicates something of the dynamic quality; it is due to the work of the philosopher of science Imré Lakatos.

present have also been cases of Y, this does not substantiate the claim that all future cases of X will also be Y. In philosophical circles, this is known as Hume's problem, or the problem of induction. The most that can be said is that if all cases of X to date have been Y, then this makes the claim that "all cases of X are Y" probable to some degree (but it is not clear *how* probable).

The problem for educational and psychological researchers, however, is compounded by further factors. In the first place, it is not the case in educational research programs that *all* cases of X up to the present time have been studied. Piaget has studied only a small number of children, including his own; and Kohlberg's universal claims concerning the stages of moral reasoning were based, in the first instance, on a sample of seventy-two boys in Chicago he studied while doing his doctoral work in 1958 (and much subsequent work has, in fact, been longitudinal work on the same sample).⁴ Unfortunately, perhaps, the total number of human youngsters somewhat exceeds the seventy-two male Chicagoans alive in 1958!

The second, and fatal, difficulty is that even in the small number of cases that have been studied, it usually happens that *not* all cases of X are also Y, thus obviously refuting the universal claim that "all X are Y." Consider an example from an early paper by Kohlberg on cognitive stages and pre-school education: he was illustrating his viewpoint that the stages of development are always in an invariant (that is, *unvarying*) order, and he used the example of the development of the concept of a dream in a sample of ninety children to make his universal claim. He wrote that "if there is an invariant order of development . . . all children should fit one of the patterns. . . ." Then, in a striking passage, he went on to report his evidence:

The fact that only 18 out of 90 children do not fit one of these

⁴ A thorough technical critique of the Kohlbergian research is to be found in William Kurtines and Esther Greif, "The Development of Moral Thought: Review and Evaluation of Kohlberg's Approach," *Psychological Bulletin*, vol. 81, no. 8 (August), 1974.

patterns is acceptable evidence for the existence of invariant sequence in the development of the dream concept.⁵

In a situation where one negative case out of ninety would be sufficient to refute the universal claim that was being advanced, the ignoring of counter evidence that totals twenty percent of the sample should be enough to confirm the average consumer's skepticism.

The work of Piaget and his colleagues does not seem to be so blatantly faulty, but even here there is considerable controversy. Many researchers have been struck by the replicability of Piaget's classic experiments: when a group of children (the Xs) are studied in the way Piaget describes, they do all appear to react in the way that he said they would (the Xs all appear to display Y). This universality, however, is challenged if the experiments are repeated using more rigorously scientific controls; for example, Peter Bryant at Oxford reports obtaining the opposite results to Piaget when the studies are done under tighter conditions.⁶ There are some grounds, then, for the skeptic to conclude that possibly the only universal generalizations to be found in the human sciences are the ones uncovered centuries ago by Dr. Johnson — the only things certain are taxes and death.

The limits of statistical methods

The foregoing discussion leads naturally to the next point warranting skeptical attention: many of the "human sciences" are heavily statistical in orientation, and their research results are, at best, probabilistic. A typical situation, especially in educational

⁵ L. Kohlberg, "Cognitive Stages and Preschool Education," *Human Development*, vol. 9, 1966, p. 11. (My emphasis). This and other defects in Kohlberg's work are discussed in D. C. Phillips and Jennie Nicolayev, "On Assessing Kohlberg's Stage Theory of Moral Development," in D. Cochrane, C. Hamm and A. Kazepides (eds.), *The Domain of Moral Education* (in press).

⁶ Peter Bryant, *Perception and Understanding in Young Children* (N.Y., Basic Books, 1974).

research, is the following: a population of interest is identified (all adolescent math students, for example), and because it is not feasible to study *everyone*, a sample is taken following one of several standard procedures. Two groups are established at random, and after pre-testing, one of these is given the "experimental treatment" (such as, a new method is used to teach a particular mathematical concept) while the control is "untreated" (or, rather, taught by the regular method). A post-test is administered. It may turn out that the experimental group's scores have improved more than those of the control group, in which case (if the gain is sufficient) the new treatment is judged to be a success.

A problem arises from the fact that not all members of the experimental group (or of the control group) will profit — or suffer — to the same degree. Some members of the control group will profit from the way they are taught to a greater degree than will some of the experimental group, and vice versa. The results showing that the experimental group's scores have improved more than the control group's are the group *averages*. The benefits of the treatment obviously are not clear-cut.⁷

The next issue that arises, then, is whether the average gain by the experimental group represents a real average gain or whether by chance the experimental group was composed in such a way that its average was higher even though the experimental treatment was in fact no more efficacious than the regular treatment. To answer this question — or rather to give guidance, for the question can never be answered absolutely — a statistical test of significance will usually be performed, and if the odds seem high enough, it will be concluded that the difference between the experimental and the control groups is a real, rather than a chance, difference.

There is a host of complex issues here. The statistical procedures themselves are often misunderstood or misinterpreted, and there is

⁷ The recent work of Lee J. Cronbach and Richard Snow shows that the same treatments affect students with different aptitudes or characteristics in a differential fashion. For references, and discussion of other difficulties facing social sciences research, see D. C. Phillips, "Forty Years On: Anti-Naturalism and Problems of Social Experiment and Piecemeal Social Reform," *Inquiry*, 19, 1976, pp. 403-25.

a growing body of critical literature that points out, among other things, that statistical significance is *not* a measure of how much confidence we can have that the experimenter's hypothesis is correct (if only we *could* have calculated how much faith to have in the hypotheses of a Newton or Einstein or Darwin or Jensen, a great deal of trouble would have been averted). Technically, the test only gives information about the *sample*. A typical statement on the evils of significance testing and the like comes from the psychologist and methodologist David Bakan:

The vast majority of investigations which pass for research in the field of psychology today entail the use of statistical tests of significance. . . . I will attempt to show that the test of significance does not provide the information concerning psychological phenomena characteristically attributed to it; and that, furthermore, a great deal of mischief has been associated with its use. If the test of significance does not yield the expected information concerning the psychological phenomena under investigation, we may speak of a crisis; for then a good deal of the research of the last decades must be questioned.⁸

To help the neophyte understand (or, cynically, to help him or her misunderstand) the statistics, researchers often provide a verbal gloss. A nice series of examples once again can be taken from the work of the Kohlbergians on moral development.⁹ As is the case in other behavioral research, the results of the Kohlbergians' work are probabilistic in nature—the figures (at best) illustrate that *trends* are present, trends that may or may not be statistically significant. The results never show that *all* experimental subjects reacted in exactly the same way and to the same degree. And so we come to a recent paper in the *Harvard Educational Review* by John Gibbs, one of Kohlberg's co-workers. In a brief section titled "A Research Review," a section notable for its lack of hard data, Gibbs reported on the available literature in glowing terms such as:

⁸ David Bakan, *On Method* (San Francisco, Jossey-Bass, 1969), Ch. 1, pp. 1-2. This chapter, and some thirty other papers on this and related topics, is reprinted in Morrison and Henkel, *The Significance Test Controversy*.

⁹ The example that follows was taken from D. C. Phillips and Jennie Nicolayev, *op. cit.*

"were much more likely" (without saying how much more likely), "markedly amenable" (without saying how markedly or how amenable), "found greater change in the upward direction" (without saying how much greater, or how reliable the findings were, or how much change was found in the reverse direction), "found significant upward change" (without saying how significant), "found positive correlations" (without saying how positive), "has generally supported the hypothesis" (without saying anything about the support which by implication was found for the counter-hypothesis as well).¹⁰ Kohlberg himself sets a high standard with respect to glossing the statistical difficulties, and his writings are replete with statements of the following type:

Over a period of almost twenty years of empirical research, my colleagues and I have rather firmly established a culturally universal invariant sequence of stages of moral judgment. . . .¹¹

The consumer's skepticism is further heightened by the fact that two independent researchers, reviewing the literature afresh, reached a somewhat sobering conclusion from the same statistical evidence:

Not only is there no clear-cut evidence supporting the assumption of invariance of stages and their hierarchical nature, but there is also evidence suggesting that these assumptions may be incorrect.¹²

Nor is this situation unusual; it often happens that data collected and analyzed by one team of researchers is re-analyzed, with different results, by another team. Indeed, the evaluation data from the *Head Start* program has been analyzed *three* times, with different conclusions being reached on each occasion.

¹⁰ John C. Gibbs, "Kohlberg's Stages of Moral Judgment: A Constructive Critique," *Harvard Educational Review*, vol. 47, no. 1, Feb. 1977, pp. 48-9.

¹¹ L. Kohlberg, "The Claim to Moral Adequacy of a Higher Stage of Moral Judgment," *Journal of Philosophy*, LXX, Oct. 1973, p. 630.

¹² W. Kurtines and E. Greif, "The Development of Moral Thought: Review and Evaluation of Kohlberg's Approach," *Psychological Bulletin*, vol. 81, no. 8, August, 1974, p. 469.

Trivially true research

Consumers of educational research are often struck by the fact that the conclusions presented to them are not particularly startling – the researcher often seems to have settled upon something rather obvious. Sometimes this comes about because the research is, in philosophical jargon, trivially true; that is, it is true by definition, or true by virtue of the meaning of the key terms involved. An example would be a piece of research that led to the conclusion that “close-minded” people are less likely to change their views than “open-minded” people.¹³

Sometimes, of course, the triviality may be disguised, but an alert consumer should still be able to detect it. An example is the work on learning hierarchies by Robert Gagné and his co-workers, work which again has had impact on curriculum construction.¹⁴ Gagné approached the problem of human learning from the point-of-view of determining the prerequisites for specific learning tasks (such as, the learning of a mathematical operation – perhaps the solving of complex multiplication problems using logarithms). Thus, item A might be a prerequisite for learning item B so that B can only be mastered after A; but then B itself may be a prerequisite for C, and C for D, and so on up a hierarchy. Gagné introduced his theory of prerequisites for learning in the following way:

From where does the student begin, and where is he going? What are the specific prerequisites for learning, and what will he be able to learn next? . . . What is meant by ‘prerequisite’ is not that fourth-grade social studies must precede fifth-grade social studies. Rather, the meaning is that learning to pronounce foreign words must precede learning to use them in sentences; or that learning to count numerically must precede learning to add numbers.¹⁵

¹³ My informant guarantees that this is a real example!

¹⁴ This example is taken from D. C. Phillips and Mavis E. Kelly, “Hierarchical Theories of Development in Education and Psychology,” *Harvard Educational Review*, vol. 45, no. 3, August, 1975.

¹⁵ Robert M. Gagné, *The Conditions of Learning* (London, Holt, Rhinehart & Winston, 2nd edition, 1973), p. 26.

Now, it is trivially true that one cannot speak a foreign sentence if one cannot speak any foreign words; this follows from the meaning of the term "sentence" — it is, by definition, something composed of words. Similarly, it is trivially true that one cannot solve mathematical problems using logarithms if one cannot first do addition, for part of the procedure involved in logarithms is adding. The skeptic begins to wonder why Gagné and his co-workers feel impelled to do experimental research on these trivially true issues.

These examples also show that information that is trivially true may nonetheless be useful. It is useful for math teachers, for example, to be reminded that students who have trouble with addition will also (and as a necessary consequence) have trouble with logarithms. It is important, however, that such information be recognized for what it is; and when researchers spend large amounts of time and money in seeking out such trivially true items and in "verifying" them experimentally, and then announce them as great discoveries, the pennywise consumer is entitled to be a little chagrined.

The problem of the suppressed premise

There is a gap between the world of fundamental research in the sciences and the everyday world in which human activity takes place. The researchers use sophisticated techniques and specialized apparatus, and their world is a theoretical one which is populated, perhaps, by such quaint entities as quarks and quantum leaps; such crass things as tables and chairs do not appear in their universe of discourse.¹⁶ The findings of such research, then, do not automatically apply to the everyday world. Links of some sort have to be established — premises linking the quarks or quantum leaps (or the findings associated with these) to tables and chairs or whatever.

To take a simple illustration pertinent to the field of education:

¹⁶ For a lively discussion of this issue, and a strong attack on several noted scientists who confused the technical with the everyday language, see L. Susan Stebbing, *Philosophy and the Physicists* (N.Y., Dover, 1958).

from the fact that a Piagetian researcher reaches some conclusion about *decalage* with respect to certain conservation tasks in pre-operational children (children between the ages approximately of 2 and 7 years), the "implication" does not logically follow that a teacher working with appropriately aged children ought to do certain things. The Piagetian theory does *not* have built-in as part of its conceptual apparatus the teacher, or classrooms, or particular school curriculum content. To apply the Piagetian findings to the classroom, some link has to be provided — for example, it has to be shown that conservation, *decalage* and so forth are relevant issues for teachers, and that no other factors ought to outweigh these in deciding classroom practice (*i.e.*, political or moral or financial or cultural or other psychological factors are less important in deciding what the teacher should do than are the Piagetian findings).

At this point a further complication arises. It is possible for several different people, who accept the same theoretical position or the same set of research findings, to differ with respect to the "implications" for practice. This happens because these people have different sets of linking premises and assumptions.¹⁷

The final complication is that many researchers do not realize that linking premises are involved in applying their theory or research findings to practice and therefore do not state them clearly. In other words, the links — which may be open to challenge, or for which alternatives may be found (thus leading to different practical implications) — often are suppressed. An example, involving the currently fashionable research on the different functions of the left and right hemispheres of the human brain, appears in a recent volume of the *Phi Delta Kappan*. The author, Leslie A. Hart, reports on research as to how various parts of the brain process information, and he writes (with his own emphasis):

The processing depends little on what or how the teacher has presented, and greatly on the total, previous stored experience in that particular brain. Thus the standard presentation, lecture, reci-

¹⁷ For further discussion, and examples, see D. C. Phillips, *Theories, Values and Education* (Melbourne, Melbourne University Press, 1971), Chs. 1, 2.

tation, and discussion that take up most of the instructional time in classrooms cannot be expected to produce learning in any reliable way.¹⁸

As it stands, this is a classic *non-sequitur*. The only premise stated is about information *processing*, while the conclusion is about reliable *learning*. Obviously there is a missing premise that in some way links processing and learning. A little reflection raises the suspicion that such a premise would not be particularly credible. (To take a simple analogy: how a hand-held electronic calculator processes information is one matter, and it is determined by the "wiring" within the instrument, while the problems the calculator are used for, or which finger the operator uses to punch the information in, and so forth, are quite other matters. Furthermore, different brands of calculators process information quite differently — "reverse Polish" versus "algebraic" — and yet they can master the same tasks!)

The is/ought dichotomy

The consumer of educational research would be wise to be alert for a particularly invidious special case of the suppressed premise. Research findings take the form, roughly, of "X is Y," or "the probability of an X having the feature Y is p"; in other words, they are statements of the "is" form (or one of its locutions, such as "all X are Y"). On the other hand, implications for practice take some such form as "person A ought to do Z to person B"; in other words, they are statements involving an "ought" or "should" or some other locution involving the passing of a value judgment. But it is a point of logic that from statements only involving the use of "is," a conclusion involving "ought" or one of its locutions cannot validly be deduced.¹⁹ Linking premises, involving value judgments, must be involved, whether the researcher is aware of them or not.

¹⁸ Leslie A. Hart, "The New 'Brain' Concept of Learning," *Phi Delta Kappan*, vol. 59, no. 6, February 1978, p. 394.

¹⁹ There is some debate among philosophers about special cases in which an "ought" might follow from an "is," but the point in this present paper is not affected. See W. D. Hudson (ed.), *The Is/Ought Question* (London, Macmillan, 1969).

And as was the case with other suppressed premises, these linking value premises or assumptions can often be challenged, or rival value premises may be found.

A hypothetical, but nonetheless realistic, example can serve to illustrate various points made in the last two sections.²⁰ Suppose that a psychologist of Piagetian orientation found that the concepts involved in understanding the National Anthem could not be mastered by children until they reached the "formal operations" period of development (approximately at the age of eleven). What would be the "educational implication" of this psychological discovery?

It might be thought that the implication is clear-cut: that the National Anthem should not be taught until children are about eleven. But this conclusion is *not* implied by the psychological discovery taken by itself. Certainly it is *compatible* with the discovery, but the policy of not teaching the National Anthem follows from the psychological discovery only if it is assumed (the hidden value premise) that children should only be taught what they can understand — that they should never be required to memorize material that is meaningless to them. Put more formally the line of argument is:

Psychological theory or finding:	Children under eleven cannot understand the National Anthem.
Suppressed value premise:	Children should not be required to learn what they cannot understand.
Conclusion (or policy implication):	Children under eleven should not be taught the National Anthem.

Now it is clear that the value or linking premise in this argument is one that can be challenged, and it is possible that other linking premises could be substituted in its place, leading to a different "educational implication." Thus, many people feel that the benefits of knowing the words of the National Anthem (such as the emotional thrill of participating in singing it, or the social cohesion that

²⁰ This example is based on D. C. Phillips, *Theories, Values and Education*, Ch. 2.

it produces) far outweigh the fact that young children will not understand the words. The more formal expression of this argument would run:

Psychological theory or finding:	Children under eleven cannot understand the National Anthem.
First linking or value premise:	Children should be required to learn things they do not understand only if there are sufficient benefits to warrant this teaching.
Second linking premise:	There <i>are</i> sufficient benefits to warrant teaching the National Anthem.
Conclusion (or policy implication):	Children under eleven should be taught the National Anthem.

The moral of this discussion is simple: if a researcher tells his or her consumers that they ought to do certain things, the consumers in return ought to demand to inspect the researcher's line of argument and pay particular attention to the linking value premise or premises that must exist.

No greater service can be rendered to the consumers of educational research than to advise them to be cautious, and not to believe all that they are told (not that everything they are told is wrong, of course). And it would be as well to commit to memory the words of William James, who with his eminent good sense summed it all up so well so long ago:

I say moreover that you make a great, a very great mistake, if you think that psychology, being the science of the mind's laws, is something from which you can deduce definite programs and schemes and methods of instruction for immediate schoolroom use. Psychology is a science, and teaching an art; and sciences never generate arts directly out of themselves. An intermediary inventive mind must make the application, by using its originality. . . .²¹

²¹ William James, *Talks to Teachers on Psychology* (London, Longmans, 1925 impression), pp. 7-8.

FOUND POEM

For the serious collector only,
a unique copy of *Essais*,
in the original binding, signed.
Upper joints cracking but still sound,
edges slightly foxed,
all corners rubbed,
spine worn.
With infrequent illuminations by the author.
Tight (on occasion) and (generally) clean,
(sometimes found in) printed wrappers.
A portion of the fly-leaf is missing.
Many pages water-stained, some badly torn,
all else almost fine.
On page 32, the sound of kissing.
On pages 65-66 and thereafter,
constant references to sex
and much laughter.
Final pages still uncut;
(will eventually be) boxed.
Small folio, hand sewn.
Westfield (New Jersey), 1934.

MARILYN R. MUMFORD

The Hungry Student

JOAN S. LIPSITZ

Before speaking further about culture, I must remark that the world is hungry and not concerned with culture, and that the attempt to orient toward culture thoughts turned only toward hunger is a purely artificial expedient.

What is most important, it seems to me, is not so much to defend a culture whose existence has never kept a man from going hungry, as to extract, from what is called culture, ideas whose compelling force is identical with that of hunger.

We need to live first of all, to believe in what makes us live and that something makes us live — to believe that whatever is produced from the mysterious depths of ourselves need not forever haunt us as an exclusively digestive concern.

I mean that if it is important for us to eat first of all, it is even more important for us not to waste in the sole concern for eating our simple power of being hungry.

Antonin Artaud, *The Theater and Its Double*

Chris Kirkland of Phillips Academy has led me through Artaud's concept of hunger by substituting "education" for "culture" in the quotation above. It is his concern, as a talented teacher of adolescents, "to extract, from what is called [education], ideas whose compelling force is identical with that of hunger." That is a curricular concern, and an essential one.

My approach to "hunger" is a developmental concern which precedes curriculum. Adolescence is a hungry time. We know this in the literal sense from those teenagers who raid the refrigerator and eat us out of house, home and budget. Adolescence is also a keenly yearning, seeking time. It is a time of emotional and social

"hunger" whose "compelling force" can have the power of a quest.

Adolescents seek, for the first time in their lives, to form a commitment to self and others. Having begun the tasks of separation and individuation, they are aware of a self, a self with a personal and social destiny. Never before have they felt the implications of a future. They are hungry for friends, solitude, adventure, ideas, newness, continuity.

It is when the quest turns against self or society that we become aware of it. Adventure becomes danger. The thrust toward separation reaches beyond associational autonomy (rejecting the company of parents) to normative autonomy (rejecting the values of parents). The sense of self becomes overwhelming. Solitude becomes loneliness. Newness is alien, change disruptive. Emotional hunger, unrequited or unappeased, feeds on self or others. Then we know its force.

We must come to know its force without pathology. It is during early adolescence that the questing begins. Because so many types of growth are occurring at once — physical, emotional, social, intellectual — and so much remains unresolved during early adolescence, "the simple power of being hungry" can confound teachers and curriculum alike. There is no other time in the continuum of schooling that teachers face such variability in one classroom as they do in the junior high years. There can be a five or six year difference in biological age between a quickly maturing girl and a slowly maturing boy of the same chronological age. Intellectually, some students are dealing easily with abstractions like theorems and themes while others cannot get beyond figures and facts. (I am referring here not to intellectual ability but to intellectual maturity, à la Piaget.) These are but two examples of "age." When we consider all the ages which one young adolescent is at once — biological, social, emotional, intellectual, academic, legal — and then consider the possible combinations and permutations of ages in a class of 25 to 30 students; it is little wonder that junior high school teachers feel defeated. In fact, they often mistake this wildly variable but normal growth and individuation for mass pathology.

Teachers cannot rearrange their students' development. They cannot, by fiat, will all these ages into synchrony. It is a lesson which comes hard to school people, but we must learn to rearrange institutions to fit young people. Even were it desirable to do the opposite, it is not possible. Growth and development are inexorable. We know this to be true when we arrange space and time for pre-schoolers. We look at their developmental needs and characteristics first, then fit schedule and curriculum to them.

Pre-schoolers cannot sit still for long periods of time. They have short attention spans. They need access to bathrooms and water fountains at their level. They need appropriate outlets for creative and physical exploration. There is nothing startling about such elementary observations. They are obvious. Each one, however, is true also for young adolescents. What is startling is that we do not arrange institutional settings, especially junior high schools, to these absolutely fundamental growth characteristics.

There is a lot of "static" in the junior high school classroom. Some of it is externally created by the refusal of the school to accommodate the developmental needs of the age group. Thus, if we insist that thirteen-year-olds remain seated upright and still forty-five minutes for five or six time-segments during each day, we are bound to have institutionally created behavior problems. (Such rigidity would be considered child abuse with toddlers; with adolescents, the responsibility is shifted to the teenager who, in effect, is seen as an abusive child.) Likewise, while we nurture developing friendships among pre-schoolers, we separate friends who, upon entering puberty, are fearfully labeled "the peer group."

Teachers and administrators need to examine the institutional causes of disruptive behavior, bearing in mind that silent unhappiness is as disruptive of learning as is vocal or physical acting out. They must also be sensitive to their students' "inner static," the noise from within that is sometimes so distracting that students cannot be receptive to anything that is external to their immediate concerns.

The egocentrism of adolescence places the young teenager in a paradoxical bind. On the one hand, everyone is looking (what

David Elkind calls "the imaginary audience"). On the other hand, one is totally alone, unique in a vast, uncaring, unnoticing universe ("the personal fable"). Alone but always on stage, scrutinized but rarely understood, the young adolescent must test hypotheses more compelling than those of science classes, live through plots more enervating than Aristotelian tragedies, and learn codes more enigmatic than French idioms. There are days, sometimes weeks (and, alas, sometimes more) when no curriculum can compete with the complexities of the drama being played out within the group and within the self.

Inner static can come from the adolescent growth spurt. The onset of menstruation, the failure of an attempted intimacy, the success of an attempted intimacy, the contemplation of an intimacy not attempted, the wrath of a parent, the hurt of a friend, and on and on and on. There is so much change occurring so rapidly that sometimes all circuits must cut off because they are overloaded.

I am not arguing that young adolescents should be schooled in therapeutic clinical institutions. Adolescents are no more and no less likely to suffer from emotional disorders requiring professional intervention than are adults (the figure is about 20%). I am arguing that there are observable normal growth characteristics which we too often consider pathological, or at least deeply irritating and in need of correction. We are not as accepting of so-called teenage behavior as we are of the behavior of other school-age groups. In fact, just to call someone "adolescent" is to be pejorative.

Instead of attempting to reform adolescents, we need to harness their energies in classroom structures and with curricular approaches that mesh with their normal push toward growth and individuation. We need to drop our control mentality so we can see how hungry they are for experiences that call upon their yearnings for socially useful activity, adventure, new relationships, compelling facts and ideas, moral choice, and everything else we imply when we use such terms as "separation," "individuation" and "commitment." In too many junior high schools our children are starving.

Sometimes metaphors can be an insult. To be concerned that

people are hungry for meaning and unconcerned that they are literally hungry for food is not only an "artificial expedient," in Artaud's terms; it is immoral. Health deficiencies impair the mental and emotional development of the young. Undernutrition, episodic hunger, prenatal and early childhood malnutrition may impair neuromotor maturity and lead to school performance similar to that of learning disabled youngsters.

Even without physical and neurological deficiencies, hunger hurts. It creates an "inner static" louder than the "compelling force" of any idea. In this context, the ravenous teenager raiding the ice-box is a luxurious middle-class caricature of adolescent hunger. The ice-box, after all, has food in it.

By the junior high years, students are too private to share their problems about hunger with others, especially teachers whom they see for such a short time each day. In some schools, hunger is obvious, in some it is totally absent, and in some it is episodic and almost invisible. Some teachers discover by accident (a box of crackers left on the desk which one or two students always "steal" from) that apparently nourished students are famished until lunch period.

Physical hunger makes curricula irrelevant. We should not tolerate it as educators or as human beings. We certainly should not attempt to force-feed knowledge to a person whose stomach is empty.

But the questing hunger of the healthy, well-fed, developing adolescent should also be recognized. We manage all too often to stamp out this creative hunger, so that children who were once so eager to learn are, at a time of great plasticity and ebullience, no longer seeing the classroom as appropriate to their quests.

Pasternak says that "the whole of life is symbolic because it is meaningful." Sometimes the use of a new symbol or metaphor rearranges our awareness of the meaning of an experience. If we begin to see our students as "hungry," we can change our perception of them from anarchists to questers. By changing our perception of their behavior, we may change its communal meaning, and thereby our responses to the "simple power of being hungry."

GRAVEYARD

There is a bowl of rice
an open tin of rainwater
brittle flowers.
The Buddha is dressed
in red
and in moss.

Drive a stake into the ground
sever the heart
the lungs, the head
from the body.
We are leaving you now
shouting
to frighten your demons.
It is the law:
we must break ties
with the dead.

Three Buddhas
stand in red robes
by the roadside,
in the roots of a great tree.
They hold hands
for the next big rain
will wash them away.

GRACE MASSEY

WINTER IN NEW ENGLAND

Desire pours out the chimney
like smoke
from the lake house in Penacook.

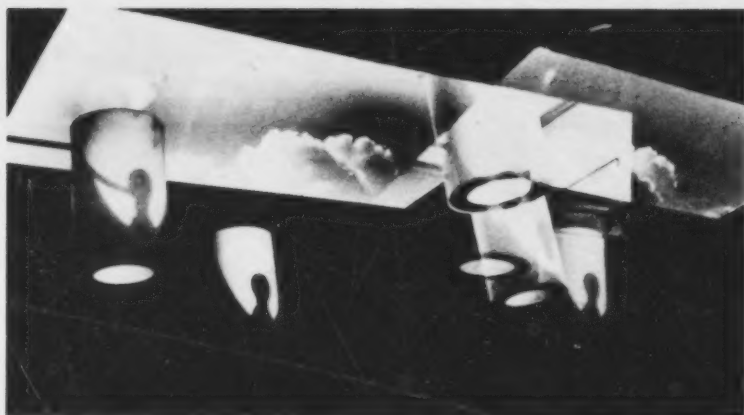
The ice is on the glass,
a Chinese empress —
elegant in her figured robe, & cold.

A little light snow
draws over the town
by the river like a lover . . .
the Charles, sleepwalking in its silver skin.

In modern suburban December
a friend's station wagon dies in a parking lot.
The cables connecting our two cars
are an expression of love & friendship.

This air
came from China, over the poles.

JOYCE E. PESEROFF



The Pre-professionals

A Self-Portrait by Late Adolescents

ELISE FORBES PACHTER

The class of 1978 is pre-eminently a group of pre-professionals. They are distinguished by their desire to become well-paid, well-regarded and effective members of society. They have directed their energies and moulded their interests around goals four to twelve years away, apprenticing themselves to purposeful, adult life-styles. Until recently, such commitment to the work-a-day world would have been anathema to high school students. Now, with what must be a prescience of future economic constriction coupled with a realistic assessment of the nature of our competitive society, they are dispensing with the years of retreat and rebellion. We may see evaporate before our eyes that peculiarly American phenomenon (and indulgence) — the adolescent years — and be re-introduced to the original meaning of the word adolescent: becoming adult.

Last year I manned a Harvard/Radcliffe booth at the District of Columbia College Day and was inundated with questions about medicine and law. Students thought the law school was not only distinct from but also alternative to the liberal arts program. No one asked about academic requirements and course distribution; they wanted to know how one applied to the law school. In England or France, this would be a perfectly reasonable question. Our system of collectively holding our pre-professionals together for an undergraduate experience has made them impatient. Energies

ready to be loosed on graduate schools are held in bound for four long years. If the tide is strong enough, the channel may break, and we'll find the liberal arts B.A stranded.

This article is based on interviews with 384 students from the greater Washington area who applied for admission to the class of 1982 at Harvard/Radcliffe. The portrait is drawn from what the applicants told their alumni/ae interviewers about their school activities and offices, community work, term-time and summer employment, career plans, grants and awards, and college-level courses and seminars. If the resulting image seems precociously polished, so much the better, for it will accurately reflect the effort this generation is putting into image-building. As co-chairman of the committee that oversees the work of the interviewers, I have heard the students in this study described and have seen both the factual worksheet and final report that resulted from their interviews. The sample of students broke down as follows: 223 men and 163 women, 42% attending school in suburban Maryland, 35% in suburban Virginia, and 26% in the District of Columbia. 68% go to public, 25% to private, and 7% to parochial schools.

One of the most serious tasks students now face is choosing a career. Planning to make college education a vocational experience, they feel that they can't get to college without having already espoused a career. The complexities of a liberal education, an education for 'life' not 'livelihood,' takes a disregard for the practical that this generation doesn't have. They are pragmatists, and pragmatists want goals. The nature of their career choices is governed by their realism: on the one hand they lean toward remunerative and established careers, and on the other hand, they try to hedge their bets. Thus, students have back-up career choices in much the same way they apply to fall-back colleges. Being aimless worries them: a number of students apologized to their interviewers for not yet knowing what they were going to do. Others, who were also undecided, spoke about keeping their options open, as if those options would shut if left unattended.

Students avoid what they see as unrealistic career choices. Of the 384 seniors, only 43 mentioned the arts as a possibility, only

ten as their sole choice. Five of these were men (an artist, an actor, a musician, a film director and a writer) and five were women (four writers and an opera singer). Theatre, dance, fine arts and museum work were all mentioned, but few students are sure that they can turn their artistic talent into a self-supporting career. The would-be dancer said that medicine and law were her safety choices. A young man who had won important art awards and who brought a stunning portfolio to his interview said that he was going to go into city planning, political science or the State Department, but, emphatically, not art. Even the practical or applied arts, such as architecture, had few takers.

Seniors were almost as cautious about careers in the social sciences and languages. There were six linguists (five with back-up choices) and five city planners. Five thought they might teach. Area studies was indicated twice by Asian-American women (Far Eastern studies), once by a future businessman/banker (Near Eastern studies) and twice by students interested in the USSR. Only the first two failed to say how their expertise would be applied. Six students marked history as their only career choice and another seven as a possibility. One pre-lawyer shared this orientation but put his finger on the problem: "history is interesting, but not very lucrative." In addition there were six political scientists, one of whom plans to work at Rand or Brookings. This is not a speculative age. I unearthed only five (four women) interested in archeology and anthropology; a single sociologist surfaced.

Two jobs that I expected to be popular, even glamorous, choices, weren't. Fourteen students are considering becoming psychologists, and six of them have other possibilities as well. This area lent itself to titles, as if to give credence to the choice: there was a "forensic psychologist," a "child psychologist," and "clinical," "research" and "teaching" psychologists. Only one student considering medicine mentioned psychiatry, and then only if he couldn't make it as a surgeon. Journalism was the second surprise: in the era (and area) of Woodward and Bernstein, sixteen considered it, but only four as their single choice.

Business is a better bet: it's considered vital, challenging and

lucrative. If we include marketing, industry, economics, finance, business administration and accounting (the categories are, of course, supplied by the students), we find seventeen women and twenty-six men, twelve of whom have it as their exclusive choice. One woman says she's attracted to business because it is "active, varied, practical"; another calls it "something dynamic." One man envisions it as part of a career that includes business, economics, law, journalism and math; a pragmatically-minded entrepreneur will combine "business, banking, the stock market and Near-Eastern studies."

A larger group of students among the 384 is interested in government; of these fifty-four, twenty-two have it as their only plan. Because these are Washington students, quite a few appreciate the fact that the federal government is a good employer. The highest office aspired to was congressman. "Politician" is an acceptable title (again, we are in Washington). One realist listed his choices in ascending order: "civil servant, political aide, politician." Almost as many women as men are interested in the political arena, and more women than men plan to enter the foreign service.

We come now to the second largest body of students: the pre-lawyers, twenty-six women and thirty-six men. Of the women choosing law, a number had very specific ambitions: practicing "tax law," or "criminal law," being a Supreme Court Justice, or "upholding human rights in a centralized political environment." The striking thing about this career choice is that, like that of government, it attracts almost equal numbers of women and men. Correcting for the percentage of women in the over-all sample, law trails government but leads business as a choice for women.

By far the most attractive careers today are in medicine and science: here there are 61 women and 147 men. The categories used are "pre-med" (favored by women), "doctor" (favored by men), veterinarian, dentist, medical research, engineering, science, computer work, electronics, aero-space. Nowhere else do we see such precision of choice nor such precocity of specialization. The largest group prefers medicine: twenty-two women and forty-six men. Unlike all the career choices we have discussed above, the

majority of these students have no fall-back careers. Another symptom of their decisiveness is the thought that has gone into post-graduate specialties: "pediatrics, ophthalmology, or ob/gyn," "brain surgeon," "diagnostician," "family practice" and "internal medicine."

A number of science pre-professionals have already served in the field: at least twenty-six have had fellowships from the National Science Foundation, American Heart Association or American Cancer Society. These grants put students in professional settings. Thirteen have worked at the National Institutes of Health (NIH). Thus, for students who compete for grants as early as the summer after 10th grade, it is possible to have been a "pre-med" student for six years before applying to medical school. This comes as close to an apprenticeship system as the profession allows. One woman was listed as sole author of a paper which came out of an NIH lab: her mentor felt that she deserved the credit for the work. Other students are co-authors with full-fledged members of the scientific community, an impressive credential at sixteen or seventeen.

Pure scientists are also numerous. Here again there are grants (Telluride, Bausch and Lomb, Westinghouse and university programs for the gifted) to be won. Traditionally at this age one applied oneself to winning prizes at science fairs; for the talented student today, this is a way-station long since passed. Only six mentioned it. More than in any other field, a young science student can get a glimpse of what actually lies ahead and make educated choices: "synthetic chemistry," "physical chemical research," "toxicology," "energy research, optics or subatomic particle research." Such refinements of career choices are admittedly ambitious, but they reassure the student of his own seriousness of purpose.

Aside from those who plan to do medical research (12) there are nineteen who mention science generally, and another sixty who have chosen specialties. The largest single group among the specialists is the mathematicians, followed by biologists (the only group with a significant number of women), physicists and chemists.

Applied scientists are less common: twenty-two engineers and six computer experts. In aeronautics there are also six, including a woman who plans to work on the space shuttle.

Students are taking college courses in record numbers while in high school. Twenty-five mentioned that they were taking at least one course in a local college; two were full-time enrollees who were still going to graduate with their high school classes. Even knowing that the advanced courses will have no effect on their standing in the Ivy League colleges, students are eager to add to their academic loads. They would prefer not to sample non-competitive courses at their high schools or have an easy senior year; they are anxious to get on with "it." Eighteen students said they had been to college summer courses and university-sponsored seminars; nearly as many had been to the Governor's School for the Gifted in Virginia.

Since future employment is an important goal, it follows that students are exercising their work ethic while in high school. 70% of my sample had been employed; of the jobs held (I counted jobs, not students, so some students contributed more than one job description) one quarter were career-related. The vast majority of these vocational jobs were in the sciences — working in labs. A surprising number of students combine work and study. One boy works at the A&P 30-35 hours a week; 20-30 hours at a local shop is not infrequent. Students surround their school commitments with work, be it for spending money or professional advancement. Necessity is not the dominant note. Working appeals. Of the 339 jobs described, only a handful — six and fourteen respectively — were in areas I associate with my high school years, social service jobs and camp counseling.

As I looked at the descriptions students gave of the involvement in community affairs, my findings confirmed the serious and career-minded profile we have seen above. Forty students were active in church groups, an additional two as church elders, and twenty in the Boy and Girl Scouts. The next-largest group had worked in political campaigns and offices. Then came those helping the young or elderly, followed by a small group volunteering in hospitals.

There were seven student advisors to adult committees, two more had responsible neighborhood planning jobs, and one was on the board of an alternative house. What is striking about the picture that emerges of student community activity is that it emphasizes responsibility rather than social action. Students are associated with organizations, not crusades.

Among school activities, the ones with influence and high visibility and the ones for which one has to compete are the most popular. First comes sports, then publications (in descending order — newspaper, literary magazine, yearbook), student government, music and drama. Of middling attractiveness were the activities that help hone academic skills: languages, "It's Academic" (a T.V. quiz show), debate and forensics and, last in this category, the model U.N.

The group of activities in which there was least interest tells us the most about this generation. Those clubs that do not train for competition, but stress personal fulfillment, were only infrequently mentioned. Social service and tutoring had twelve members, chess eleven, strategic games seven, art six and dance five. Student relations committees (black/white relations) also had five members, conservation and ecology three, and women's groups two. (The women's movement, while it no longer spawns new discussion groups, has had its effect: this generation of young women is profession-bound from the beginning. Only one woman mentioned marriage — as did one man.) Issues clubs are almost defunct. It's back-to-basics, back to the competitive, organize! leadership-improving activities. Judging from my sample, no single goal aside from the desire to have a career moves this generation.

While high school students may at times feel the need to join forces for a cause they believe in, they are unimpressed with the attendant idealism. They lack the experience necessary to be cynics, but their caution and objectivity have similar results. A local student wrote to the *Washington Post* on May 8 about his reactions to Sun Day observances:

Sun Day was very special to me because I learned an important

lesson. Along about the second or third "do," it suddenly dawned on me that I had always envied the older kids in high school and college who were deeply involved in the anti-war movement. But I was too young. I was making myself believe that this was my chance to be involved in a great cause.

Here I was running around Washington, finally able to do what those kids had done. But solar energy isn't peace, it's a bunch of Boy Scout projects. And nuclear energy isn't a corrupt war in Vietnam, it's a very complicated necessity that some people hate simply because it's very big and messy. And this wasn't a movement, it was a bunch of kids and adults, who should have known better, acting silly.

For a while I was right in there with them, creating a phantom enemy and chanting about a phony panacea just so we could satisfy our fantasies about living in the past. But after a while, I got embarrassed and made it back in time for my accounting class.

Dennis L. Loomis, Silver Spring (Md.)

It takes more than a simple statement of purpose to become a pre-professional. It takes a distinct attitude. It also requires self-discipline to make decisions and to stick by them. To have that discipline one must have a strong motivator. The main sources of motivation are, not surprisingly, money and status. As one student put it, being a doctor gives one a high level of self-esteem. When people wonder why this generation should be particularly concerned about these basic needs, they are implicitly comparing them to the last generation of students. Yet students are not traditionally a class apart in America — as they are in Europe — and don't derive their attitudes from earlier students. They derive them from their families and society at large. The activists of the 60s were atypical. Today's generation is in harmony with the security-minded and materialistic generation of their parents. The current concern about the erosion of the economic security of the middle class is shared by parents and children alike.

The pre-professional is busy preparing to be an adult. Many students bring C.V.s to their interviews, often with supporting materials. The professionalism and attention to detail is astonishing. One applicant listed, *inter alia*, her membership subscriptions,

illustrating graphically her interest in nature. The C.V. covered four single-spaced typed pages. Visions of the future self dominate. 'Who will I be?' is not a philosophical question and can be answered by professional initials, as for the candidate who wants to be "a J.D. and an M.B.A." Students are planning to take concurrent degrees and pursue composite careers (I can't figure out whether a law-business-international affairs combination makes a generalist or a micro-specialist), prepared for any and everything.

Many applicants believe that going to the 'right' college will open the 'right' doors. One student said that he was applying to Harvard because of the reputation of its medical school. Applicants choose Harvard in order to be Harvard seniors choosing law schools. "It's the best," "You can't beat Harvard" are their expressions of faith in the system. Two types of students rely most heavily on the reputation of Harvard: those who are unlikely to get in but who believe that just as the name is magic, perhaps something in their record will have the magic to trigger that door. "Harvard doesn't always take the obvious candidate," said one woman to me two years ago, after a spirited discussion of her qualifications. The other kind of student has mastered the workings of his high school and believes in the power of perfection. 4.0 averages exist in almost all the public high schools, although at the most competitive, they are hard to attain. Most of the high-powered students are in the 3.8-3.9 range (if one can call it a range). Their averages usually slipped over 9th grade gym, or the bright student's nemesis — driver's ed. The discrepancy between excellence and perfection is a source of embarrassment to the student, who almost invariably volunteers an explanation.

Bent on distinction, students are also able to see that there are other ways to influence their admission. Ethnic and racial background is known to be a factor. Two candidates had a great deal to say about the one-quarter of themselves that was American Indian, and in one case, an advisor had steered the candidate toward further involvement with the American Indian heritage so that it would be unmistakable among other community activities. Another enterprising but less sophisticated senior took pains to point out

that in her *particular* Montgomery County high school, being Jewish put her distinctly in the minority!

The effect of preparing oneself for a certain end is far-reaching. This generation of high school students is precociously interested in adult life-styles, not for their freedom, but for their responsibility and productivity. Students are eager to take on the demands of the age group above them. One student traced her community activities back to the time she was 13 and "stagnating." The precocity is unleavened by experience. Just because the measure of oneself has become academic perfection, responsible commitment to activities and careful preparation for professionalism, there has been a serious disregard for the uncontrollable realities of the world at large. In fact, students are subject to forces they can't influence: the opportunities are non-negotiable. And no one mentions luck.

If self-esteem, sense of purpose and pride is to a great extent bound up in one's work (and if this process begins at age 14 as a voluntary act rather than at 22 as an unpleasant task), then the apprenticeship system that has informally been created had better have built-in guarantees. The professional schools will have to turn back the percentage of students that they feel cannot reasonably expect employment in that field, or they will produce a large class of skilled unemployed whose debts are enormous and whose earning power is inadequate. It worries me that self-esteem so neatly coincides with social status, for some of the students will have to seriously reconsider their self-image during their college years or after graduate school. It could be disastrously disillusioning to have as a goal the unattainable. It is probably easier to satisfy or retain the generalist who "wants to help people" or "do something relevant" than the specialist who knows exactly what he wants to do. At the least, serious job counseling and cautioning should begin when the student is still deciding about his major. And one should take advantage of the vocational mood to let students know where the jobs are.

While it is important that students learn how to work effectively with groups and develop their leadership capabilities, the simply pleasant pursuits should not be lobbed off at age 17. What satis-

fies the self may or may not be the basis for a paying job, but time is not so precious that one can't cultivate it. When I applied to college, one of the most important qualities one could present was the cultural exposure represented by foreign travel. Today, we have applicants who have spent years abroad worrying about what they have missed by not attending American high schools and feeling somehow disabled by their overseas experience. Yet travel is not mere exoticism, and to abandon it as part of an education is parochialism.

There is another potential hazard of early specialization: unless retraining and second careers become part of the process, some students will have been routed so long in one direction that other important interests will have atrophied or never have a chance to develop. It will be hard to be flexible about where to go when one has already spent so much time and energy trying to get there. A friend who recently served on a medical admissions committee told me that students at their interview asked her what they should be like to get in: "I'll do anything you say." What is initially powered by enthusiasm and interest will more likely come to rely on the sting of competition and the need to have one's plans survive. Too many students worry about having activities and employment that all point convincingly in one direction, as though they can more easily get where they want to go by seeming as though they have already gotten there.

Above all, our society may not be able to support a huge professional class at the pay now expected. The generation of the mid-to-late 50s and their children of the late 70s and early 80s have put a lot of faith in the maxim that where there's a will, there's a way. For the sake of the pre-professionals, the system had better bear this out.

LIVING WITH CATS

One of them walks down the stairs,
Pauses to sniff my shoes.
Flattered, I watch her linger,
Exploring the smell
Left by the press of my foot.

Later I open the back door.
Scattered feathers, a curled entrail, still soft,
Fragments of bone,
Lie randomly on the porch.

These finely furred cats, greedy for sunlight,
Push their faces, slit-eyed, into my lap,
Spilling my projects
To the ground.

What are these projects?
I want to know
How am I to live in this body
Sniffing our pleasures
Slashing at things that fly,
Rubbing myself against aliens?
What is to be done about love?

SUZANNE GALLANT



GREGORY MOTEN

An Anatomy of Learning*

Twenty-seven Fractions in Search of a Common Denominator

PETER FARROW

"Oh, that's easy! A good
teacher cares more about
learning than teaching. . . ."
Lisa, aged 9

One of the graver hazards of teaching is students. Challenged by other adults or by inner doubtings, the teacher can usually muddle through. One may even muddle through an entire symposium. But no one muddles long or safely with students. Their challenges often batter the walls of our presumptions — and our ignorance.

* This work is drawn, in part, from ongoing lectures and dialogues here at Country Mile, some of which were concurrent with the Andover Symposium. Organic concepts of learning derive, obviously and as noted, from Pierce, James, Dewey and others, less obviously though more vitally from the long-standing work of Dr. Albert Barnes, Violette de Mazia and the Barnes Foundation as a whole. I am indebted to Brian Drayton of Harvard for the dozen years of happy hassle over some of these concepts; to Stefani Burk of the Center for New Learning & Research for much critical discussion and suggestion; and to William Brown of *The Andover Review* for his long encouragement — and patience about deadlines.

For more years than I'll confess to, I've been nagged by the comment quoted above. I can't blame Lisa. It was in answer to my own question: *What makes a teacher 'good'?* Neither can I disagree with her, except on one point: it is not at all easy. I know a little about teaching, and I certainly care a great deal about students' learning. But I don't *know* about learning.

I suspect I am not alone. Learning has accumulated a host of concepts, theories and methods beyond hope of consensus. But on analysis, most deal not with learning *per se* but with the external production of it; the thing itself remains largely undefined. The result is an abiding ambiguity overshadowing our efforts, including those of the Symposium. While we spoke well and listened bravely, as for *learning itself* we were twenty-seven fractions in search of a common denominator.

Can, then, an objectively valid definition be discovered?

The problem of criteria

Such a definition must stand as a very common denominator indeed, meeting the sturdiest of criteria. It must function in and be demonstrable by scientific inquiry, presenting not only general constancy and principle but some immunity to the nibblings of minutiae and specificity. It must provide full play to the scholarly, the philosophic and the spiritual while fortifying no exclusive cult. It must translate clearly to the empirics of teaching and should be simple enough to be grasped and used by the child.

But these deal only with the human sphere. To be objectively valid, the definition must encompass an infinite diversity of phenomena outside that sphere. We must be able to discern its principles wherever learning is found, from *Homo symposiensis* to *Amoeba proteus*.

It is at this point that either hackles or indulgent smirks begin to rise. To accord such attributes as consciousness, abstraction, volition, cognition to protozoa, when we are barely willing to accord them to Yale or Stanford, is to invite being charged with the most heinous of scholarly crimes, Anthropomorphism. Still, it may prove

to be worth the risk, for fear of that grisly charge may be the chief impediment to our understanding. Let us then preempt it with the countercharge of Apotheosis and give that Olympus of singularity, from which Man views all things non-Man, a long-overdue shaking. This goddish view is uncopernican, unscientific and downright silly. From mouth to anus we confess our alimentary debt to the worm; we concede our bones' chemical kinship to the oyster; we cheerfully compare our anatomical scheme with the frog, while sharing lactation with shrew, sloth and whale. Might we not, then, share a cognitive principle or two as well?

Polemics aside, we have more to fortify that contention than to refute it, when learning is given objective scrutiny and considered as a function essential to, and inseparable from, the interaction of organism with environment — whether that organism be processionary caterpillar or Ph.D.

Such a view is hardly new. This organic, experiential concept is the basis of much of the theory advanced by Pierce, James, Dewey, Barnes and others in the first half of this century. But their views can be (and are) dismissed as being more philosophic than scientific. Do they coalesce with the "hard" sciences as developing in this century's second half? I believe they do, and that a marriage of ideas can give us some insights into learning and, by them, provide at least a rough definition.

"Learning" and "government"

One of the hardest of those "hard" sciences is cybernetics, which possibly can provide a model for the discovery of our definition.

As in education the root idea is *learning*, cybernetics' root is *government*. Objectively seen, *government* is found to possess meaning far beyond its conventional political contexts. That meaning, reduced to principle, is as validly applicable to machine and amoeba as to man. By its principles we may analyze the control of a missile, the workings of a political system or the ethological squirmings of protozoa, since all involve some form of government.

Cybernetics has arrived at its principles not, as popularly sup-

posed, by some abracadabrous technology but by consistently considering the phenomena of government where they may occur, without *a priori* exclusion.

Such a notion is hardly unique to cybernetics. It is the notion of all sciences and the premise of each. To the chemist (as Rumer Godden delightfully noted) "all things are pure — even horse-droppings. . . ." The elements of chemistry, their individual natures and their combinant principles reside in biscuits, monkeys, frisbees and the chemist himself. There are no special tables of elements for Man, nor special laws of gravity for his descent.

Nor, perhaps, special principles for his learning.

An anatomy of learning

Like any good science, let it begin with hypothesis — in our matter, a hypothetical definition. Let us say that learning, simply enough, is that process by which the known is applied to the unknown.

In rough, this meets most of the criteria cited. Indeed, it enhances them. For the scientist, it describes both process and purpose of science; for the scholar, it implies the highest laurels of scholarship, while providing philosopher and theologian with a sound *raison d'être* (long needed). For the teacher, it works best of all: it summarizes and justifies vocation, hints at both method and curricula and, while retaining the critical fuzziness, might lend a certain euphony to grant proposals.

For the child, of course, it is just a stuffy way for grownups to describe what he has been doing all along.

We might hope for consensus, even unanimity, were we to restrict this definition to human learning. But we must look at learning wherever it occurs, if we are to discover its objective principles: "Applying the known to the unknown" is an exceedingly pervasive process.

In an objective context, it is possible to construct, in very general cybernetic terms, a sequence of functions utilizing past learning and culminating in new learning, by application of known to

unknown. These functions may be listed as

Sensing – the receipt of stimuli by the organism;

Referral – the interpretation of stimuli into meaning, by reference to a memory system;

Selection – establishing priority of stimuli;

Formulation – the planning of response, in terms of the interpretation given the stimuli and in terms of

Preparation – the “mustering” of resources necessary and available for executing response; thence

Efferent Order – to the effector parts to perform the response; and

Afferent Order – the feedback from effector parts and supplemental sensings regarding the status of the order and the result of its execution, which may or may not require

Correction – of at least the initial efferent order and, potentially, of the whole sequence back to the point of selection.

Finally, as the product of these, there occurs

Storage of information derived from the success or failure of the response, and made retainable for future reference. It is this last which we call *learning*.

We might take, as example, a very young child who, in the process of learning to walk, trips over a rug, picks himself up and goes on. The sequence of functions described above can easily be identified, but to restrict it to the event alone would be missing the idea of learning.

Let us say that, at some future time, the same child, toddling across a lawn never before known to him, comes across a watering hose, never before seen by him, but – in spite of these being unknown – he steps over the hose and so does not trip. The child has, in effect, abstracted the idea of tripping, transferring the experience of one event known to another unknown. He is dealing, if you will, in metaphor: in the trippingness or trippability of rug and hose. He is, in a word, learning. The functions involved, of

course, apply to positive example as well, without end, and not only to child but to all life, as we shall see.

Presumptions and inferences

Such a "cybernized" view as I have given, in listing the functions associated with learning, may seem mechanistic, if not rube-goldbergian. It is intended only to serve as a sort of mapping or checklist. Broadly, these functions are the governing constituents of biostasis. In operation, of course, the functions are not linear, on a one-then-two-then-three basis. Each reciprocates and modifies the others.

It is important now to define these functions more closely, for two reasons: first, to take into consideration inference as well as specific operation; second, to shed some long-standing presumptions.

One of the commoner presumptions is conceiving sensing as relating only to extrasomatic stimuli — those arising outside the organism's biological entity. In reality, by far the greater number and frequency of stimuli arise within the body. Through proprioceptive and kinesthetic sensings, for instance, we know the location, state-of-readiness and motion of our bodily parts. But we fall into another presumption by the use of that word *we*, which presumes duality between mind and body. Stimuli are generated by and within the mind alone; we have the sensations of thinking — cognition, ideation, intuition, just plain old hunch — plus the whole grab-bag of emotions. There is no end of sense.*

Referral and *selection* are so closely reciprocal as to be parts of the same function, neither having completion without the other. Two aspects of selection are worth noting carefully: the selection of one stimulus over another is not random; and it is not necessarily relatable to the amplitude of the stimulus. Thus the whole raw

* And thus a tidy possibility, not for the scientist, but the philosopher and theologian: since all sensation is referred to some process of judgment; since we sense within our minds and that, too, is judged; and since we sense that judgment, too, thus making it subject to referral, *ad infinitum*, where does judgment stop? At *ubergeist*? Ultimate Particle? Soul? Or Judgment?

data of sensation must be submitted to some sort of critical reference for interpretation, the specific selection being governed in terms of criteria so provided. What this infers, in all life, in at least a prototypical way, is judgment.

Selection, referral and judgment do not just imply but absolutely require some sort of memory system. In its objective sense, memory is "stored experience" — the cumulative learning derived from individual and species, inherited as well as acquired. What we call "instinct," then, lies in continuity with, rather than opposed to, what we call "intelligence." Though this means shedding our favorite of all possible presumptions, that instinct and intelligence are somehow mutually exclusive, no objective evidence for that presumption exists, from the standpoint of function. Each requires, and complements, the other — a point we shall return to in a moment.

The formulation of response requires some form of selective judgment on at least a binaretic, or yes/no, do/don't basis. It may be seen, in essence, as being akin to the forming of hypothesis in formal scientific method. Here again we run afoul of a presumption: that scientific method is an invention of mankind, reserved to the higher flights of human inquiry. Objectively, it is the essential method of all life, and all life is functionally equipped to perform it. Formulation stands, then, as the rudiment of imagination, the fundamental what if? — a critical run-through of possible responses and possible results by which is chosen that response deemed most likely to succeed. (Though an organism chooses to make no response, it is still responding.)

The choice of response is determined by the preparatory factors — what we have called here a "mustering of resources." It is important that these not be limited to proprioceptive and kinesthetic sensings, to the motor potentiation of tool, fist, fang, claw or pseudopod. Resources include memory, experience, judgment as well — the basic ingredients of ideas.

In the efferent/afferent functions, the critical factor is correction, not merely of the specific motor order* given, but potentially

* By uncertainty, any efferent order must be presumed to require correction at some point, since it is subject to entropy, and since it is predictive, not empiric. It aims only as closely as it can; it cannot guarantee absolute bullseyes.

of the whole hypothetical plan. (Here again we bump into a presumption, this time just a colloquial one: properly, hypothesis is not proven by trial and error, but by trial, error and correction.) Any form of correction infers judgment's again coming into play, weighing the empirical against the theoretical, the actual against the imagined – expectation fulfilled, modified or nullified by experience.

* * * * *

All of these functions imply *learning* – the application of the known to the unknown. The particular learning may indeed be slow to the point of despair, but it not only will, it must, take place.

It is here that we must return to that great dichotomous wrangle, Instinct *versus* Intelligence. All learning involves some measure of abstraction. Abstraction is the very stuff of intelligence – and man is extraordinarily stuffy about it. Let us marshal our *hubris* and *trudge* on.

Abstraction, instinct and evolution

Once shorn of our presumptions, instinct appears not as some immutable code programmed into an organism from Day One onwards, but as both a form and a product of abstraction – the same “metaphoric” function that saved our exemplary child from tripping on the hose.

Our customary view of instinct is, technically, assbackwardoidal. We think of the organism as acting out his allotted role for his allotted time in a strictly allotted way: instinct rules supreme, triggering every nibble and kneejerk of his existence. Historically, the exact reverse is true: Instinct's rules arose from the individual, and however slowly, still arise. Through the learning functions we have set down here, the organism's responses to its environment were either successful or not successful. If not, it went back to square one, or died. If successful, it reproduced and passed its learning on – as instinct.

Each living organism is a monument to past success, its instinct

a digest of previously-successful behavior — a sort of spiral-bound Handy Pocket Guide to Biostasis. But it is a digest, not an encyclopedia, an abstraction of experience into learning, of learning into meaning.

Instinct is abstracted not out of quantitative considerations, not because it is more economical to abstract than to pass empirical experience along wholesale. While not infinite, the capacity for genetic transfer of information is massive and, current knowledge indicates, would tend to increase to accommodate more information rather than to reduce the informational load — although fraught with trivia and vestigia. Empirical information could be passed along wholesale. It is abstracted simply because it must be, regardless of how vital or successful the empirics of the past.

The operant word there is past. Were instinct to imprint absolutely exact responses on the organism, the organism would still have to respond in and to an environment which, neither subject to instinct nor predictable by it, can be not only subtle but often downright mean. All instinct can do, then, is hope for the best in terms of the past. Life, being variable, demands variability of response; otherwise adaptation would be impossible.

Each generation and each individual in each generation are not the slaves but the crucibles of instinct, testing, confirming, modifying and, in varying degree, erasing and rewriting the lessons of the past learning — a process otherwise known as evolution.

Consciousness and volition

We have been seeking some sort of common denominator for learning, considering it as a process inherent and necessary to all life. *All*, like *never*, is a very dangerous word, and has kindled more than one *auto-da-fe*. Are there exceptions?

The principles themselves can be evidenced by rather basic behavioral experiment and demonstrated in analogue by cybernetic model. But what of consciousness, volition and the dozen other attributes which traditionally separate Man from lesser beasts?

Such questions may be begged: they are not strictly scientific and arise from theological and philosophic considerations, at least

historically. But what seems of importance here is that the principles hold true even in the context of the special phenomena of human affairs.

In an objective sense, physiological consciousness is observable, all the way down the ladder, as is the will to live. Awareness, at least as we know it, can only be speculated on, as can conscience — both of them fairly recent developments in man himself, and still not suffering from overabundance. Concern for, and ability to project, the future — much touted as exclusively human characteristics — have their functional prototypes at the lowest levels. "Formulation of response" projects the future, albeit a very short-term future; provision for the future is evidenced not only in reproduction and genetic variation, but in the individual organism's latitude of response — in the way in which each applies the known to the unknown, the individual accumulation of learning.

Argument for the human exception is, objectively, moot: we are seeking principle, of which will, consciousness, morality, conscience are not qualifying factors *per se*. A man wilfully stepping out of an airplane does not fall at some special rate of acceleration because he chose to fall, is aware of falling, and can project the consequences of his descent. Though he recite a *Te Deum* and the whole of Heyl's equation, he must stick it through with the same principles of gravity affecting an apple's fall from its tree. Man's responses to falling will indeed be different: very few apples invent parachutes — a point on which we might credit man were it not that even fewer apples* need them.

Man's uniqueness is for the most part quantitative, residing in the number and variety of his responses and resources (including his extragenetic and extrasomatic storehouses). But the scheme by which he responds, by which he applies known to unknown, remains in principle the same though, for himself, he may insist that it be called not scheme but *schema*.

* Regarding apples: I have otherwise restricted this polemic to the animal kingdom, protozoa alone being a large enough mouthful for human presumption to swallow. But the principles of learning can be applied to all life — animal, plant or academic.

Proofs

There comes now what we might punnably dub the Moment of Proof. Much of the foregoing is, of course, speculative and inferential — speculation and inference being two of the commoner ways of applying the known to the unknown. The evidence is circumstantial, deductive and thereby vulnerable. I have stated principle not so much in terms of what is, as what must be: there must be, say, some sort of memory system, some means of judgment, some form and degree of abstraction.

Function and evidence of function exist even though we cannot precisely trace that function to a specific anatomical seat or system. Obviously, a Proteus exhibits no homologue of the human brain, but it does, by some analogous method, functionally apply known to unknown. If we fail to see just how it turns the trick, the fault lies in the present state of our knowledge and not in Old Phoney-foot.

Personally, I do not feel any present lack of "hard" evidence will be of long duration. We will inevitably continue to apply the known to the unknown, even in the rubble of Olympus. It may even come as a relief to discover, after these long, lonely, Ptolemaic years, that all life is intelligent, all life learns.

WHEN SHE THINKS OF IT

she thinks perhaps of light
in a corner room. There are no curtains.
Only the clean windows, blue
with sky, the hanging plants that pattern
the bare wood floor with shadows.

Sometimes she thinks of someone else,
you perhaps, with flowers
from the shop where she used to walk
before the pain.
Sometimes she thinks of pain.

And if she thinks of floating
it's not on air or clouds, the river risen
to the windows but the light.
She thinks of floating
on the light.

MARTHA COLLINS

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